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Mellanox Firmware Tools (MFT) User Manual

Rev 2.3

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Table 1 - Revision History Table (Sheet 1 of 3)

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August 2014	2.2	Added the following sections: • Section 2.5, “Mlxfwreset - Loading Firmware on 5th Generation Devices Tool”, on page 56 • Section 1.4, “Mellanox Software Tools (MST) Service”, on page 14 • Section I, “Booting HCA Device in Livefish Mode”, on page 98 Updated the following sections: • Section 2.2, “mlxfwmanager - Firmware Update and Query Tool”, on page 24 • Section G, “Update Package for Mellanox Firmware”, on page 91 • Section 2.3.1, “flint Synopsis”, on page 33
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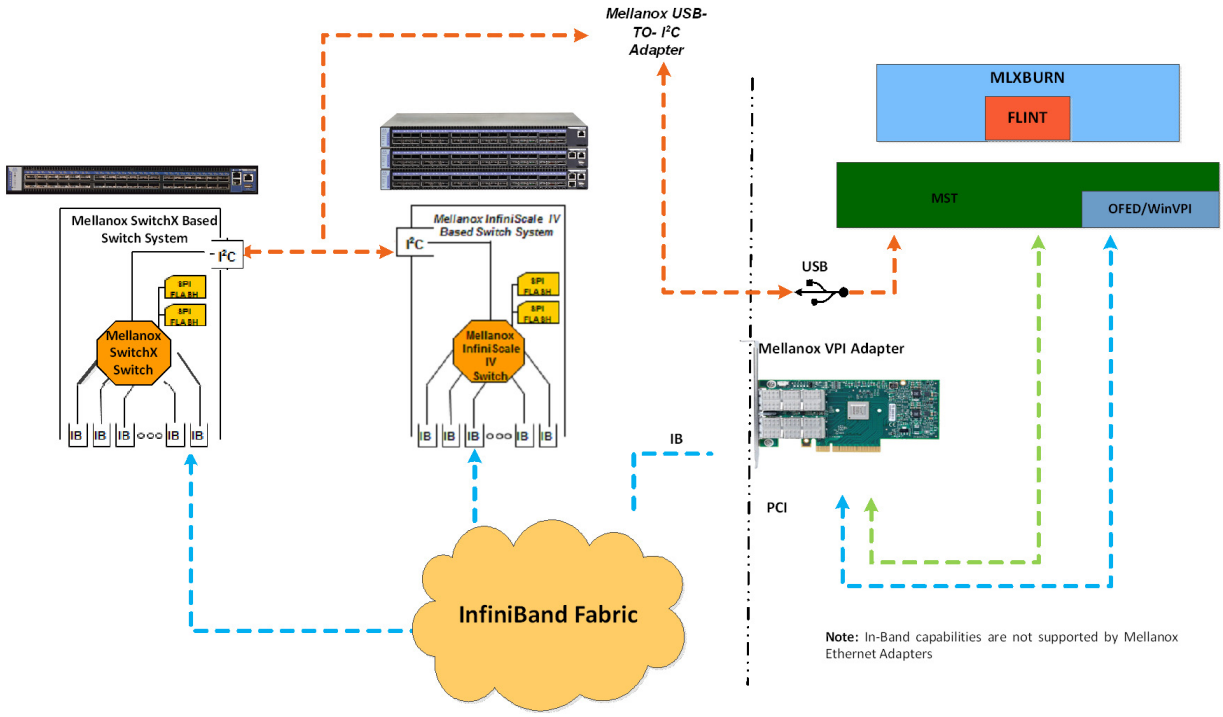
1 Introduction

The Mellanox Firmware Tools (MFT) package is a set of firmware management and debug tools for Mellanox devices. MFT can be used for:

- Generating a standard or customized Mellanox firmware image
- Querying for firmware information
- Burning a firmware image to a single Mellanox device

The list of the available tools in the package can be found in the Release Notes document.

Figure 1: Mellanox Firmware Tools – A Scheme of Operation



1.1 Common Abbreviations and Acronyms

Term	Description
MFT	Mellanox Firmware tools
MST	Mellanox Software tools and it's the name of the script that starts/stops the driver used by MFT tools
mlx	Extension of the text firmware file which contains all the firmware content
ini	Extension of the firmware configuration file which is in INI format and contains card specific configurations.
bin	Extension of the binary firmware file which is a combination of INI and mlx file

Term	Description
MFA	Extension of the a firmware file that contains several binary files of firmware for different cards/boards
4th Generation Family	Contains the following devices: ConnectX®-3 Pro, Infniscale® IV, SwitchX®, SwitchX®-2 and BridgeX® ConnectX-3
5th Generation Family	Contains the following device: Connect-IB® Switch-IB™

1.2 Supported Operating Systems

Please refer to the release notes of your version for supported platforms and kernels.

Unless explicitly specified, the usage of the tools is identical for all operating systems.

1.3 MFT Installation

OS	Install	Uninstall
Linux	1. Download the Linux MFT package from the Mellanox Management Tools webpage: http://www.mellanox.com/products/management_tools.php 2. Untar the downloaded package 3. Allow packaging of bins to self executing file. 4. Run 'install.sh' **For OEM only:** 'install.sh --oem' 5. Start the mst driver by running: mst start **NOTE:** It is possible to customize some installation parameters (such as the target installation path). Run 'install.sh --help' for details.	Stop the mst driver by running: mft_uninstall.sh
Windows	The installation is EXE based: 1. Download the Windows MFT package from the Mellanox Management Tools webpage: http://www.mellanox.com/products/management_tools.php. 2. Double click the EXE file and follow the instructions presented by the installation wizard.	1. Go to Add or remove programs. 2. Remove WinMFT64 depending on the platform type.
FreeBSD	1. Download the FreeBSD MFT package from the Mellanox Management Tools webpage: http://www.mellanox.com/products/management_tools.php. 2. Untar the downloaded package. 3. Run "`install.sh`"	Uninstall MFT on FreeBSD, run the following command: `mft_uninstall.sh`

OS	Install	Uninstall

VMware	1. Download the MFT for VMware vib package from: http://www.mellanox.com/products/management_tools.php
	2. Install the package. Run:
	`# esxcli software vib install -v <MST Vib>`
	`# esxcli software vib install -v <MFT Vib>`
	NOTE: For VIBs installation examples, please see below.
	3. Reboot system.
	4. Start the MST driver. Run:
	`# /opt/mellanox/bin/mst start`
		1. Uninstall the package. Run:
		`# esxcli software vib remove -n mft`
		2. Uninstall the MST:
		• VMKlinux:
		`# esxcli software vib remove -n net-mft`
		• Native:
		`# esxcli software vib remove -n nmst`
		3. Reboot system.

Example (VIBs installation):

- VMK:

```
esxcli software vib install -v /var/log/net-mst-3.8.0.45-1OEM.550.0.0.1331820.x86_64.vib
esxcli software vib install -v /var/log/mft-3.8.0.45-10EM-550.0.0.1331820.x86_64.vib
```

- Native:

```
esxcli software vib install -v /var/log/nmst-3.8.0.45-1OEM.600.0.0.2295424.x86_64.vib
esxcli software vib install -v /var/log/mft-3.8.0.45-10EM-600.0.0.2295424.x86_64.vib
```

The MFT tools are not located in the default path. In order to run any MFT tool either:

- Enter the full path. For example:
  `/opt/mellanox/bin/flint`

OR

- add MFT path to the default system path by running:
  `export PATH=$PATH:/opt/mellanox/bin`[1]

1. The path is temporary and will hold only until reboot

1.4 Mellanox Software Tools (MST) Service

This script is used to start MST service, to stop it, and in other operations with Mellanox devices such as resetting or enabling remote access.

1.4.1 MST Synopsis

mst

```
mst <command> [switches]
```

1.4.1.1 Commands and Switches Description

mst start [--with_msix] [--with_unknown][--with_i2cdev] [--with_lpcdev]	Create special files that represent Mellanox devices in directory /dev/mst. Load appropriate kernel modules and saves PCI configuration headers in directory /var/mst_pci. After successfully completion of this command the MST driver is ready to work and you can invoke other Mellanox tools like Infiniburn or tdevmon. You can configure the start command by edit the configuration file: /etc/mft/mst.conf, for example you can rename you devices. Options: --with_msix : Create the msix device. --with_unknown : Do not check if the device ID is supported. --with_i2cdev : Create Embedded I2C master
mst stop	Stop Mellanox MST driver service, remove all special files/directories and unload kernel modules.
mst restart [--with_msix] [--with_unknown][--with_i2cdev] [--with_lpcdev]	Just like "mst stop" followed by "mst start [--with_msix] [--with_unknown][--with_i2cdev] [--with_lpcdev]"
mst server start [port]	Start MST server to allow incoming connection. Default port is 23108
mst server stop	Stop MST server.
mst remote add <hostname>[:port]	Establish connection with specified host on specified port (default port is 23108). Add devices on remote peer to local devices list. <hostname> may be host name as well as an IP address.
mst remote del <hostname>[:port]	Remove all remote devices on specified hostname. <hostname>[:port] should be specified exactly as in the "mst remote add" command.

mst ib add [OPTIONS] [local_h-ca_id] [local_hca_port]	Add devices found in the IB fabric for inband access. Requires OFED installation and an active IB link. If local_hca_id and local_hca_port are given, the IB subnet connected to the given port is scanned. Otherwise, the default subnet is scanned. Options: --discover-tool <discover-tool>: The tool that is used to discover the fabric. Supported tools: ibnetdiscover, ibdiagnet. default: ibdiagnet --add-non-mlnx : Add non Mellanox nodes. --topo-file <topology-file>: A prepared topology file which describes the fabric. For ibnetdiscover: provide an output of the tool. For ibdiagnet: provide LST file that ibdiagnet generates. --use-ibdr : Access by direct route MADs. Available only when using ibnetdiscover tool, for SwitchX and ConnectIB devices. **NOTE**: if a topology file is specified, device are taken from it. Otherwise, a discover tool is run to discover the fabric.
mst ib del	Remove all inband devices.
mst status	Print current status of Mellanox devices Options: -v run with high verbosity level (print more info on each device)
mst save	Save PCI configuration headers in directory /var/mst_pci.
mst load	Load PCI configuration headers from directory /var/mst_pci.
mst version	Print the version info

1.4.2 Using mst.conf File

To configure the start operation in Linux, the configuration file:

`/etc/mft/mst.conf` should be edited.

The `conf` file consists of lines of rules, every line will be a rule for mst start.

The rule general format:

```
$OPCODE $PARAMS
```

Table 1 - mst start Supported OPCODES

OPCODES	Definition	Description
`RENAME`	renames mst devices	• Rule format: RENAME $TYPE $NEW_NAME $ID • Supported types: # MTUSB (where $ID is the iSerial) • Example: `RENAME USB my 0x2A4C.` • Effect: MTUSB with serial 0x2A4C will be renamed to /dev/mst/mymtusb-1 (always mtusb-1 will be concatenated to the new name).

The conf file must be valid - The rules should be unique, and no duplication of new names and/or serials.

The command is supported only by Linux.

1.4.3 Examples of mst Usage

- ***To start Mellanox MST driver service:.***

```
# mst start
Starting MST (Mellanox Software Tools) driver set
Loading MST PCI module - Success
Loading MST PCI configuration module - Success
Create devices
MTUSB-1 USB to I2C Bridge - Success
```

- ***To stop the service:***

```
# mst stop
Stopping MST (Mellanox Software Tools) driver set
Unloading MST PCI module - Success
```

- ***To print the current status of Mellanox devices:***

```
# mst status
MST modules:
------------
    MST PCI module loaded
    MST PCI configuration module loaded

MST devices:
------------
/dev/mst/mt4099_pciconf0         - PCI configuration cycles access.
                                 domain:bus:dev.fn=0000:0b:00.0 addr.reg=88 data.reg=92
                                   Chip revision is: 01
/dev/mst/mt4099_pci_cr0          - PCI direct access.
                                   domain:bus:dev.fn=0000:0b:00.0 bar=0xd2600000
                                   size=0x100000
                                   Chip revision is: 01
/dev/mst/mtusb-1                 - USB to I2C adapter as I2C master
                                   iSerial = 0x1683
```

➢ ***To show the devices status with detailed information:***

```
mst status -v
MST modules:
------------
   MST PCI module loaded
   MST PCI configuration module loaded
PCI devices:
------------
DEVICE_TYPE        MST                   PCI    RDMA   NET             NUMA
ConnectX3Pro(rev:0) /dev/mst/mt4103_pciconf0
ConnectX3Pro(rev:0) /dev/mst/mt4103_pci_cr0 03:00.0 mlx4_0 net-eth0,net-eth1   0

I2C devices:
-------------------
MST                          Serial
/dev/mst/Xmtusb-1            0x104a
/dev/mst/mtusb-1             0x1cdc
```

For further information on In-Band and Remote Access, please refer to Appendix C: “In-Band Access to Multiple IB Subnets,” on page 83, Appendix F: “Accessing Remote InfiniBand Device by Direct Route MADs,” on page 89 and Appendix E,“Remote Access to Device by Sockets,” on page 87

1.5 MFT Access to Hardware Devices

Table 2 lists the Mellanox devices supported by MFT, the supporting tools, and the access methods to these devices.

Table 2 - Supported Mellanox Devices

Device Type	Product Name	HW Access Method		
		PCI	I2C	In-Band
HCA (InfiniBand)	MT2760xA0 Connect-IB®	V	V	V
VPI Network Adapter	MT25408 ConnectX®[1]	V	V	V
	MT25408 ConnectX®-2	V	V	V
	MT27508 ConnectX®-3	V	V	V
	MT27528 ConnectX®-3 Pro	V	V	V
Ethernet Adapter (NIC)	MT25408 ConnectX® EN	V	V	
	MT25408 ConnectX®-2 EN			
	MT27508 ConnectX®-3 EN			
Switch	MT58100A0 SwitchX®	V [2]	V	V
	MT48436 InfiniScale® IV	V[2]	V	V

Table 2 - Supported Mellanox Devices

Device Type	Product Name	HW Access Method		
		PCI	I2C	In-Band
	Switch-IB™	V[2]	V	V
Bridge	MT64102 BridgeX®[1]	V[2]	V	V

1. Is not fully tested.
2. For managed switch products only.

MFT tools access Mellanox devices via the PCI Express interface, via a USB to I2C adapter (Mellanox P/N: MTUSB-1), or via vendor-specific MADs over the InfiniBand fabric (In-Band).

In-Band device access requires the local IB port to be in the ACTIVE state and connected to an IB fabric.

All MFT tools address the target hardware device using an *mst device name*. This name is assigned by running the command ‘mst start’ (in Windows, it is not required to run the **"`mst start`"** command) for PCI and I2C access. In-Band devices can be assigned by running the 'mst ib add' command.

To list the available mst device names on the local machine, run `'mst status'`.

Local PCI devices may also be accessed using device aliases. Supported aliases are:

- PCI device “bus:dev.fn” , E.G.: 03:00.0
- OFED RDMA device, E.G.: mlx4_0
- Network interface with “net-” prefix, E.G.: net-eth2

Run `mst status -v` to list the devices and their available aliases.

The format of an mst device name is as follows:

- ***Via PCI:***

  ```
  # mt4099_pci_crX
  ```

  where:

  X is the index of the adapter on the machine.

  _crX devices access the adapter directly (recommended if possible)

  confX devices use configuration cycles to access the adapter

  For example:

  ```
  # mt25418_pci_cr0
  ```

- **Via USB to I2C adapter:** For example, mtusb-1.
- **Via Remote device:**

  ```
  /dev/mst/mft:23108,@dev@mst@mt4103_pci_cr0
  ```

- **Via ibdr device:** For example, /dev/mst/CA_MT4113_server1_HCA-3_ibdr-0,mlx-5_0,1 or ibdr-0,mlx5_0,1.
- **Via In-Band:** <string>lid-<lid_number>.

  For example:

  ```
  /dev/mst/CA_MT4099_mft_HCA-1_lid-0x0002 or simply "lid-2""
  ```

  The “mst ib add” command adds devices in the format:

  - for adapters and bridges:

  ```
  CA_<device id >_<ib node description>_lid-<lid number>
  ```

  - for switches:

  ```
  SW_<device id >_lid-<lid number>
  ```

  See Step 3 in Appendix B,“Flow Examples - mlxburn,” on page 38 for instructions on how to obtain the device LID

- **Via PCI user level:** <bus:dev.fn>

  For example, if you run *lspci -d 15b3*: Mellanox devices and PCI Device IDs will be displayed.

  ```
  # /sbin/lspci -d 15b3:
  02:00.0 Ethernet controller: Mellanox Technologies Unknown device 6368 (rev a0)
  ```

1.6 Reference Documents and Downloads

- To download firmware images and their release notes, see http://www.mellanox.com/page/software_overview_ib
- Mellanox OFED (for Linux) is a software stack that can be downloaded from http://www.mellanox.com > Products > Adapter IB/VPI SW > Linux SW/Drivers.
- Mellanox WinOF (for Windows) is a software stack that can be downloaded from http://www.mellanox.com > Products > Adapter IB/VPI SW > Windows SW/Drivers.
- *ibdiag* tools – run ‘man ibdiagnet’ for details on a machine with OFED installed.
- Mellanox OFED (for ESXi) is a software stack that can be downloaded from http://www.mellanox.com > Products > Adapter IB/VPI SW > VMware Drivers.

2 Firmware Generation, Configuration, and Update Tools

2.1 mlxconfig - Changing Device Configuration Tool

The mlxconfig tool allows the user to change some of the device configurations without burning the firmware once more.

It supports the following 4th Generation devices: ConnectX®-3, ConnectX®-3 Pro.

The configuration is also kept after reset.

The tool requires:

- OFED/WinOF driver to be installed and enabled
- Access to the device through the PCI interface (pciconf/pci_cr)
- Firmware supporting changing device configurations feature:
  - Version 2.31.5000 or above
  - Supported devices: ConnectX®-3/ConnectX®-3 Pro
  - Changing device configurations enabled.

For changes after a successful configuration to take effect, reboot the system

2.1.1 mlxconfig Synopsis

```
# mlxconfig [-d <device> ] [-y] < set [parameters] | query | reset >
```

where:

-d|--dev <device>	Performs operation for a specified mst device.
-y|--yes	Answers yes in prompt.
-v|--version	Displays version info.
-h|--help	Displays help message.
q[uery] 1	Queries current supported configurations[1].
s[et] [2]	Sets configurations to a specific device.
r[eset]	Resets configurations to their default value.

1. Query command will query a single device if a device is specified, otherwise will query all devices on the machine
2. For a list of the parameters to set please see Table 2.

2.1.1.1 Supported Configurations and their Parameters

Table 3 - Supported Configurations and their Parameters

Feature	Description	Parameter	Values
SR-IOV	Sets the device virtualization parameters	SRIOV_EN Enables or disables virtualization	0: disable 1: enable
		NUM_OF_VFS=<NUM> Sets the number of virtual functions to allocate	1 to 128 (maximal number of virtual function may be smaller as it depends on the PCI BAR size and available system resources)
Wake on LAN[1]	Enables/disables Wake on LAN feature	WOL_MAGIC_EN_P1 Enables or disables Wake on magic packet for port 1	0: disable 1:enable
		WOL_MAGIC_EN_P2 Enables or disables Wake on magic packet for port 2	0: disable 1:enable
BAR size	Sets the BAR size that the system allocates per physical and virtual function	LOG_BAR_SIZE Log (base 2) of the number of megabytes to be allocated per physical and virtual function	0 to 9 (maximal size may be smaller as it depends on SR-IOV settings)
VPI settings	Configures the port's working mode	VPI_SETTINGS_PORT1 Configures port 1 working mode VPI_SETTINGS_PORT2 Configures port 2 working mode	1: InfiniBand 2: Ethernet 3: VPI (auto-sense)

1. For supported devices only listed in this section.

The default value for the parameters listed in the table above is firmware dependent.

Before setting the number of VFs in SR-IOV, please make sure your system can support that number of VFs. If your hardware and software cannot support that number, this may cause your system to cease working. Therefore, mlxconfig protects the user by making sure that when setting SR-IOV parameters, the value of NUM_OF_VFS*PCI_BAR_SIZE(1) must not exceed 512. Also, NUM_OF_VFS must not exceed the limit defined by the firmware (128 VFs upper bound).
The same calculation applies to BAR size settings.

(1) PCI_BAR_SIZE refers to the PCI BAR size per function, either physical or virtual .

In case there was no server booting after enabling SRIOV, please refer to “Troubleshooting” on page 77

2.1.2 Examples of mlxconfig Usage

2.1.2.1 Querying Current Device Configuration

To query the current device configuration, use the following command line:

```
# mlxconfig -d <device> query
```

Example:

```
# mlxconfig -d /dev/mst/mt4099_pciconf0 q

Device type:    ConnectX-3
PCI device:     /dev/mst/
/dev/mst/mt4099_pciconf0

Device 1:
-----------

Configurations:                 Current
        SRIOV_EN                    1
        NUM_OF_VFS                 16
        WOL_MAGIC_EN_P1             0
        WOL_MAGIC_EN_P2             0
```

N/A means that the device default configuration is set

2.1.2.2 Setting Device Configuration

To set the device configuration, use the following command line:

```
# mlxconfig -d <device> set [Parameters....]
```

Example:

```
# mlxconfig -d /dev/mst/mt4099_pciconf0 set WOL_MAGIC_EN_P2=1 NUM_OF_VFS=24
Device type:    ConnectX-3
PCI device:     /dev/mst/
mt4099_pciconf0

Configurations:         Current      New
        SRIOV_EN            1         1
        NUM_OF_VFS          16        24
        WOL_MAGIC_EN_P1     0         0
        WOL_MAGIC_EN_P2     0         1

Apply new Configuration?(y/n) [n]: y
Applying... Done!

-I- Please reboot the system to load new configurations.
```

2.1.2.3 Resetting Device Configuration to Default

To reset the device configuration to default use the following command line:

```
# mlxconfig -d <device> reset
```

Example:

```
# mlxconfig -d /dev/mst/mt4099_pciconf0 reset
Reset configuration for device /dev/mst/mt4099_pciconf0? ? (y/n) [n] : y
Applying... Done!

-I- Please power-cycle device to load new configurations.
>mlxconfig -d /dev/mst/mt4099_pciconf0 query

Device 1:
----------
Device type:    ConnectX-3
PCI Device:     /dev/mst/
mt4099_pciconf0

Configurations:              Current
          SRIOV_EN           1
          NUM_OF_VFS         8
          WOL_MAGIC_EN_P1    0
          WOL_MAGIC_EN_P2    0
```

2.1.3 Using mlxconifg with PCI Device in Bus Device Function (BDF) Format

In order to access device in BDF format via configuration cycles, use "pciconf-" as prefix to the device.

Example:

```
# mlxconfig -d pciconf-000:03:00.0 q
```

```
Device 1:
----------

Device type:   ConnectX-3
PCI Device:    pciconf-000:03:00.0

Configurations:            Current
        SRIOV_EN             1
        NUM_OF_VFS           16
        WOL_MAGIC_EN_P1      0
        WOL_MAGIC_EN_P2      0
```

2.1.4 Using mlxconfig to Set SR-IOV Parameters

In order to set SR-IOV parameters through mlxconfig use the following command line:

Example:

```
 # mlxconfig -d /dev/mst/mt4099_pciconf0 set SRIOV_EN=1 NUM_OF_VFS=12
 Device 1:
------------

Device type:     ConnectX-3
PCI device:      /dev/mst/mt4099_pcionf0

Configurations:          Current New
       SRIOV_EN          0 1
      NUM_OF_VFS         8 12

Apply new Configurations?(y/n) [n]: y
Applying... Done!

-I- Please reboot the system to load new configurations.
```

Extended driver configuration may be required to enable SR-IOV. For further details please refer to OFED/WinOFED user manual

2.2 mlxfwmanager - Firmware Update and Query Tool

The mlxfwmanager is a Mellanox firmware update and query utility which scans the system for available Mellanox devices (only MST PCI devices) and performs the necessary firmware updates. mlxfwmanager utility has the following flavors:

- mlxfwmanager – operates on MST devices and device aliases and requires MFT installation and running "`mst start`".

- mlxfwmanager_pci – operates on local Mellanox PCI devices and does not require MFT installation. mlxfwmanager_pci gets a PCI device (in format “bus:dev.fn”) as an input to the --device option.

Other than the input device format, the mlxfwmanager and mlxfwmanager_pci tools share the same command line and functionality.

For further information on firmware update, please refer to Appendix G: “Update Package for Mellanox Firmware,” on page 91.

The examples throughout the document use pci `“bus.dev.fn”` format. However, all the examples are inter-changeable with the `mlxfwmanager -d /dev/mst/<device>` format.

2.2.1 mlxfwmanager Synopsis

```
# [-d|--dev DeviceName] [-h|--help] [-v|--version] [--query] [--query-format Format] [-
u|--update] [-i|--image-file FileName][-D|--image-dir DirectoryName] [-f|--force] [-
y|--yes] [--no] [-l|--list-content] [--archive-names] [--clear-semaphore]--exe-rel-
path] [--log] [-L|--log-file LogFileName] [--no-progress] [-o|--outfile OutputFileName]
[--nofs] [--ssl-certificate Certificate][--online] [--online-query PSIDs] [--key key]
[--download DirectoryName] [--download-default] [--download-device Device][--download-
os OS] [--download-type Type]
```

where:

-d|--dev DeviceName	Update firmware for this device (use commas between device names to specify multiple devices) **Note**: The device name format of mlxfwmanager_pci and mlxfw-man- ager is different: • mlxfwmanager_pci is PCI user level device “<bus:dev.fn>” • mlxfwmanager is MST device. Perform operation for specified mst device(s).
-h|--help	Show this message and exit
-v|--version	Show the executable version and exit
--query	Query device(s) info
--query-format Format	(Query | Online query) output format, XML | Text - default Text
-u|--update	Update firmware image(s) on the device(s)
-i|--image-file FileName	Specified image file to use
-D|--image-dir DirectoryName	Specified directory instead of default to locate image files
-f|--force	Force image update
-y|--yes	Answer is yes in prompts
--no	Answer is no in prompts
-l|--list-content	List file/Directory content, used with --image-dir and --image-file flags

--archive-names	Display archive names in listing
--clear-semaphore	Force clear the flash semaphore on the device. No command is allowed when this flag is used. **NOTE**: May result in system instability or flash corruption if the device or another application is currently using the flash. Exercise caution.
--exe-rel-path	Use paths relative to the location of the executable
--log	Create log file
-L|--log-file LogFileName	Use specified log file
--no-progress	Do not show progress
-o|--outfile OutputFileName	Write to specified output file
--nofs	Burn image in a non failsafe manner
--online	Fetch required FW images online from Mellanox server
--online-query-PSIDs	Query FW info, PSID(s) are comma separated
--key key	Key for custom download/update[1]
--download DirectoryName	Download files from server to a specified directory (if not specified, download will be saved in current work directory)
--download-default	Use Default values for download
--download-device Device	ConnectX | Connect-IB - default All
--download-os OS	(only for sfx): Linux | Windows - default All
--download-type Type	MFA | self_extractor - default All
--ssl-certificate Certificate	SSL certificate For secure connection

1. Provided by Mellanox Support Team if needed

2.2.2 Querying the Device

- To query a specific device, use the following command line:

```
# mlxfwmanager -d <device> --query
```

- To query all the devices on the machine, use the following command line:

```
# mlxfwmanager --query
```

Examples:

a. Query the device.

```
mlxfwmanager -d 09:00.0 --query
Querying Mellanox devices firmware ...

Device #1:
----------

  Device Type:      ConnectX3
  Part Number:      MCX354A-FCA_A2-A4
  Description:     ConnectX-3 VPI adapter card; dual-port QSFP; FDR IB (56Gb/s) and
40GigE; PCIe3.0 x8 8GT/s; RoHS R6
  PSID:             MT_1020120019
  PCI Device Name:  0000:09:00.0
  Port1 GUID:       0002c9000100d051
  Port2 MAC:        0002c9000002
  Versions:         Current        Available
     FW             2.31.5050      2.32.5000


  Status:           Update required
---------
Found 1 device(s) requiring firmware update. Please use -u flag to perform the update.
```

b. Query all the devices.

```
Querying Mellanox devices firmware ...

Device #1:
----------

  Device Type:      ConnectIB
  Part Number:      MCB192A-FCA_A1
  Description:      Connect-IB Host Channel Adapter; single-port QSFP; FDR 56Gb/s;
PCIe2.0 x16; RoHS R6
  PSID:             MT_1220110030
  PCI Device Name:  /dev/mst/mt4113_pciconf0
  Port1 GUID:       0002c903002ef500
  Port2 GUID:       0002c903002ef501
  Versions:         Current        Available
     FW             2.11.1258     10.10.4000

  Status:           Update required

Device #2:
----------

  Device Type:      ConnectX3
  Part Number:      MCX354A-FCA_A2-A4
  Description:      ConnectX-3 VPI adapter card; dual-port QSFP; FDR IB (56Gb/s) and
40GigE; PCIe3.0 x8 8GT/s; RoHS R6
  PSID:             MT_1020120019
  PCI Device Name:  /dev/mst/mt4099_pci_cr0
  Port1 GUID:       0002c9000100d051
  Port2 MAC:        0002c9000002
  Versions:         Current        Available
     FW             2.31.5050     2.32.5000

  Status:           Update required

---------
Found 2 device(s) requiring firmware update. Please use -u flag to perform the update.
```

c. Query XML

```
mlxfwmanager --query --query-format XML
<Devices>
    <Device pciName="/dev/mst/mt4099_pci_cr0" type="ConnectX3" psid="MT_1200111023"
partNumber="MCX354A-FCA_A2-A4">
      <Versions>
        <FW current="2.1.0065" available="2.32.5000"/>
      </Versions>
      <MACs  port1="02c90abcdef0" port2="02c90abcdef1"/>
      <Status> update required </Status>
      <Description> ConnectX-3 VPI adapter card; dual-port QSFP; FDR IB (56Gb/s) and
40GigE; PCIe3.0 x8 8GT/s; RoHS R6 </Description>
    </Device>
    <Device pciName="/dev/mst/mt4113_pciconf0" type="ConnectIB" psid="MT_1220110030"
partNumber="MCB192A-FCA_A1">
      <Versions>
        <FW current="2.11.1258" available="10.10.4000"/>
      </Versions>
      <GUIDs port1="0002c903002ef500" />
      <MACs  port1="0002c903002ef501" />
      <Status> update required </Status>
      <Description> Connect-IB Host Channel Adapter; single-port QSFP; FDR 56Gb/s;
PCIe2.0 x16; RoHS R6 </Description>
    </Device>
</Devices>
```

2.2.3 Updating the Device

- To update a device on the machine, use the following command line[1]:

```
# mlxfwmanager -u -d <device> -i <FileName>
```

Examples:

1. If only PXE rom needs update, please add -f to the command line

a. Update a device.

```
mlxfwmanager -u -d 0000:09:00.0 -i fw-ConnectX3-rel-2.32.5000.mfa
Querying Mellanox devices firmware ...

Device #1:
----------

  Device Type:      ConnectX3
  Part Number:      MCX354A-FCA_A2-A4
  Description:     ConnectX-3 VPI adapter card; dual-port QSFP; FDR IB (56Gb/s) and
40GigE; PCIe3.0 x8 8GT/s; RoHS R6
  PSID:             MT_1020120019
  PCI Device Name:  0000:09:00.0
  Port1 GUID:       0002c9000100d051
  Port2 MAC:        0002c9000002
  Versions:         Current        Available
     FW             2.31.5050     2.32.5000

  Status:           Update required
---------
Found 1 device(s) requiring firmware update.
```

2.2.4 Updating the Device Online

To update the device online on the machine from Mellanox site, use the following command line:

```
mlxfwmanager --online -u -d <device>
```

Example:

```
mlxfwmanager --online -u -d 0000:09:00.0
Querying Mellanox devices firmware ...

Device #1:
----------

Device Type:      ConnectX3
Part Number:      MCX354A-FCA_A2-A4
Description:     ConnectX-3 VPI adapter card; dual-port QSFP; FDR IB (56Gb/s) and
40GigE;           PCIe3.0 x8 8GT/s; RoHS R6
PSID:             MT_1020120019
PCI Device Name:  0000:09:00.0
Port1 GUID:       0002c9000100d051
Port2 MAC:        0002c9000002
Versions:         Current         Available
FW                2.31.5050      2.32.5000

Status:           Update required
---------
Found 1 device(s) requiring firmware update. Please use -u flag to perform the update.
```

2.2.4.1 Downloading Firmware Images and Firmware Update Packages

To download firmware images/firmware update packages, use the following command line:

```
mlxfwmanager --download <DownloadDir> --download-device <DeviceType> --down-
load-os <OS> --download-type <DownloadType>
```

Example:

a. Downloading Firmware Images/Firmware Update Packages

```
mlxfwmanager --download /tmp/DownloadDir --download-device ConnectX --download-os All -
- download-type self_extractor

------ Files To Be Downloaded ------

ConnectX :
----------

<Files>:
0 - mlxfwmanager-linux-ConnectX3_X3Pro-20140811
1 - mlxfwmanager-windows-ConnectX3_X3Pro-20140811.exe
2 - mlxfwmanager-linux64-ConnectX3_X3Pro-20140811
3 - mlxfwmanager-windows64-ConnectX3_X3Pro-20140811.exe

<Release Note>:
Fixed Minor Issues.

Perform Download? [y/N]: y
Please wait while downloading Files to : '/tmp/DownloadDir'
        0 - mlxfwmanager-linux-ConnectX3_X3Pro-20140811 : Done
        1 - mlxfwmanager-windows-ConnectX3_X3Pro-20140811.exe : Done
        2 - mlxfwmanager-linux64-ConnectX3_X3Pro-20140811 : Done
        3 - mlxfwmanager-windows64-ConnectX3_X3Pro-20140811.exe : Done

Downloading file(s) to : '/tmp/DownloadDir' is done successfully
```

b. Downloading Firmware Images/Firmware Update Packages Using Custom Key

```
mlxfwmanager --download /tmp/DownloadDir --download-device ConnectX --download-os All -
- download-type All --key last_release

------ Files To Be Downloaded ------

ConnectX :
----------

<Files>:
0 - fw-ConnectX3_X3Pro-20140610.mfa
1 - mlxfwmanager-linux-ConnectX3_X3Pro-20140610
2 - mlxfwmanager-windows-ConnectX3_X3Pro-20140610.exe
3 - mlxfwmanager-linux64-ConnectX3_X3Pro-20140610
4 - mlxfwmanager-windows64-ConnectX3_X3Pro-20140610.exe

<Release Note>:
Fixed Minor Issues.

Perform Download? [y/N]: y
Please wait while downloading Files to : '/tmp/DownloadDir'
        0 - fw-ConnectX3_X3Pro-20140610.mfa : Done
        1 - mlxfwmanager-linux-ConnectX3_X3Pro-20140610 : Done
        2 - mlxfwmanager-windows-ConnectX3_X3Pro-20140610.exe : Done
        3 - mlxfwmanager-linux64-ConnectX3_X3Pro-20140610 : Done
        4 - mlxfwmanager-windows64-ConnectX3_X3Pro-20140610.exe : Done

Downloading file(s) to : '/tmp/DownloadDir' is done successfully
```

2.3 flint – Firmware Burning Tool

The **flint** (Flash interface) utility performs the following functions:

- Burns a binary firmware image to the Flash device attached to an adapter, bridge or switch device
- Burns an Expansion ROM image to the Flash device attached to a ConnectX® family adapter devices
- Queries for firmware attributes (version, GUIDs, UIDs, MACs, PSID, etc.)
- Enables executing various operations on the Flash memory from the command line (for debug/production)
- Disables/enables the access to the device's hardware registers, and changes the key used for enabling. This feature is functional only if the burnt firmware supports it

2.3.1 flint Synopsis

```
flint [switches...] <command> [parameters...]
```

2.3.1.1 Switch Descriptions

-allow_psid_change	Allow burning a FW image with a different PSID (Parameter Set ID)than the one currently on flash. Note that changing a PSID may cause the device to malfunction. Use only if you know what you are doing
-banks <banks>	Set the number of attached flash devices (banks)
-blank_guids	Burn the image with blank GUIDs and MACs (where applicable). These values can be set later using the "sg" command (see details below). Commands affected: burn
-clear_semaphore	Force clear the flash semaphore on the device. No command is allowed when this flag is used. **NOTE:** May result in system instability or flash corruption if the device or another application is currently using the flash. Exercise caution.
-d[evice] <device>	Device flash is connected to. Commands affected: all
-dual_image	Make the burn process burn two images on flash (previously default algorithm). Current default failsafe burn process burns a single image (in alternating locations). Commands affected: burn
-flash_params <type,log2-size,num_of_flashes>	Use the given parameters to access the flash instead of reading them from the flash. Supported parameters: • Type: The type of the flash, such as: M25PXxx, M25Pxx, SST25VFxx, W25QxxBV, W25Xxx, AT25DFxxx, S25FLXXXP • log2size: The log2 of the flash size • num_of_flashes: the number of the flashes connected to the device
-guid <GUID>	GUID base value. 4 GUIDs are automatically assigned to the following values: guid -> node GUID guid+1 -> port1 guid+2 -> port2 guid+3 -> system image GUID **NOTE:** port2 guid will be assigned even for a single port HCA - The HCA ignores this value. Commands affected: burn, sg
-guids <GUIDs...>	4 GUIDs must be specified here. The specified GUIDs are assigned to the following fields, repectively: node, port1, port2 and system image GUID. **NOTE:** port2 guid must be specified even for a single port HCA. The HCA ignores this value. It can be set to 0x0. Commands affected: burn, sg

-h[elp]	Prints this message and exits
-hh	Prints extended command help
-i[mage] <image>	Binary image file. Commands affected: burn, verify
-log <log_file>	Prints the burning status to the specified log file
-mac <MAC>[1]	MAC address base value. 2 MACs are automatically assigned to the following values: mac -> port1 mac+1 -> port2 Commands affected: burn, sg
-macs <MACs...>[1]	2 MACs must be specified here. The specified MACs are assigned to port1, port2, repectively. Commands affected: burn, sg **NOTE:** -mac/-macs flags are applicable only for Mellanox Technologies ethernet products.
-no	Non interactive mode - assume answer "no" to all questions. Commands affected: all
-no_flash_verify	Do not verify each write on the flash.
-nofs	Burns image in a non failsafe manner.
--allow_rom_change	Allows burning/removing a ROM to/from Firmware image when product version is present.
-override_cache_replacement[2]	On SwitchX®/5th Generation devices: Allow accessing the flash even if the cache replacement mode is enabled. **NOTE:** This flag is often referred to as -ocr **NOTE:** This flag is intended for advanced users only. Running in this mode may cause the firmware to hang.
-s[ilent]	Do not print burn progress flyer. Commands affected: burn
-striped_image	Use this flag to indicate that the given image file is in a "striped image" format. Commands affected: query verify
-uid <UID>	**BridgeX/5th Generation devices only**. Derive and set the device UIDs (GUIDs, MACs, WWNs).UIDs are derived from the given base UID according to Mellanox Methodologies Commands affected: burn, sg

-uids <UIDs...>	**BridgeX only**. 29 space separated UIDs must be specified here.The specified UIDs are assigned to the following fields, respectively: G0-MAC-PI0 G0-MAC-PI1 G0-MAC-PI2 G0-MAC-PE0 G0-MAC-PE1 G0-MAC-PE2 G0-MAC-PE3 G0-FC-WWPN-P0 G0-FC-WWPN-P1 G0-FC-WWPN-P2 G0-FC-WWPN-P3 G0-IB-NODE-GUID G0-IB-PORT-GUID G0-FC-WWNN G1-MAC-PI0 G1-MAC-PI1 G1-MAC-PI2 G1-MAC-PE0 G1-MAC-PE1 G1-MAC-PE2 G1-MAC-PE3 G1-FC-WWPN-P0 G1-FC-WWPN-P1 G1-FC-WWPN-P2 G1-FC-WWPN-P3 G1-IB-NODE-GUID G1-IB-PORT-GUID G1-FC-WWNN IB-SYSTEM-GUID Commands affected: burn, sg
-use_image_guids	Burn (guids/uids/macs) as appears in the given image. Commands affected: burn
-use_image_ps	Burn vsd as appears in the given image - do not keep existing VSD on flash. Commands affected: burn
-use_image_rom	Do not save the ROM which exists in the device. Commands affected: burn
--ignore_dev_data	Do not attempt to take device data sections from device (sections will be taken from the image. FS3 Only). Commands affected: burn
--ignore_dev_data	Do not attempt to take device data sections from device(sections will be taken from the image. FS3 Only). Commands affected: burn
-v	Version info.
-vsd <string>	Write this string, of up to 208 characters, to VSD when burn.
-y[es]	Non interactive mode - assume answer "yes" to all questions. Commands affected: all

1. The -mac and -macs options are applicable only to Mellanox Technologies Ethernet adapter and switch devices.
2. When accessing SwitchX via I2C or PCI, the `-override_cache_replacement` flag **must** be set.

2.3.1.2 Command Descriptions

The **flint** utility commands are:

Common FW Update and Query:

b[urn]	Burn flash
q[uery] [full]	Query misc. flash/firmware characteristics, use "full" to get more information.
v[erify]	Verify entire flash
swreset	SW reset the target un-managed switch device. This command is supported only in the In-Band access method.

Expansion ROM Update:

brom <ROM-file>	Burn the specified ROM file on the flash.

drom	Remove the ROM section from the flash.
rrom <out-file>	Read the ROM section from the flash.
qrom	Query ROM in a given image.

Initial Burn, Production:

bb	Burn Block - Burns the given image as is. No checks are done.
sg [guids_num=<num> step_-size=<size>] | [nocrc]	Set GUIDs.
set_vpd [vpd file]	Set read-only VPD (For FS3 image only).
smg [guids_num=<num> step_-size=<size>]	Set manufacture GUIDs (For FS3 image only).
sv	Set the VSD.

Misc FW Image operations:

ri <out-file>	Read the fw image on the flash.
dc [out-file]	Dump Configuration: print fw configuration file for the given image.
dth [out-file]	Dump Hash: print hash file for the given image.

HW Access Key:

set_key [key]	Set/Update the HW access key which is used to enable/disable access to HW. The key can be provided in the command line or interactively typed after the command is given **NOTE:** The new key is activated only after the device is reset.
hw_access <enable|disable> [key]	Enable/disable the access to the HW. The key can be provided in the command line or interactively typed after the command is given

Low Level Flash Operations:

hw query	Query HW info and flash attributes.
e[rase] <addr>	Erase sector
rw <addr>	Read one dword from flash
ww <addr> < data>	Write one dword to flash
wwne <addr>	Write one dword to flash without sector erase
wb <data-file> <addr>	Write a data block to flash
wbne <addr> <size> <data ...>	Write a data block to flash without sector erase
rb <addr> <size> [out-file]	Read a data block from flash

Manufacture GUIDs are similar to GUIDs. However, they are located in the protected area of the flash and set during production. By default, firmware will use GUIDs unless specified otherwise during production.

2.3.1.2.1 Burning a Firmware Image

The FLINT utility enables you to burn the Flash from a binary image.

To burn the entire Flash from a raw binary image, use the following command line:

```
# flint -d <device> -i <fw-file> [-guid <GUID> | -guids <4 GUIDS> | -mac <MAC> | -macs
<2 MACs>] burn
```

where:

device	Device on which the flash is burned.
fw-file	Binary firmware file.
GUID(s) (optional, for InfiniBand adapters and 4th generation switches)	One or four GUIDs. • If 4 GUIDS are provided (-guids flag), they will be assigned as node, Port 1, Port 2 and system image GUIDs, respectively. • If only one GUID is provided (-guid flag), it will be assigned as node GUID. Its values +1, +2 and +3 will be assigned as Port 1, Port 2 and system image GUID, respectively. • If no -guid/-guids flag is provided, the current GUIDs will be preserved on the device. **NOTE:** For 4th generation, four GUIDs must be specified but Ports 1 and 2 GUIDs are ignored and should be set to 0. **NOTE:** A GUID is a 16-digit hexadecimal number. If less than 16 digits are provided, leading zeros will be inserted.
MAC(s) (optional, for Ethernet and VPI adapters and switches).	• If 2 MACs are provided (-macs flag), they will be assigned to Port 1 and Port 2, respectively. • If only one MAC is provided (-mac flag), it will be assigned to Port 1; MAC+1 will be assigned to Port 2. • If no -mac/-macs flag is provided, the current LIDs will be preserved on the device. **NOTE:** A MAC is a 12-digit hexadecimal number. If less than 12 digits are provided, leading zeros will be inserted.

Examples:

1. Update the firmware on the device, keeping the current GUIDs and VSD. (Note: This is the common way to use flint.)

```
# flint -d /dev/mst/mt4099_pci_cr0 -i fw-4099-2_31_5050-MCX354A-FCB_A2.bin burn
```

2. Update the firmware on the device, specifying the GUIDs to burn.

```
# flint -d /dev/mst/mt4099_pci_cr0 -i fw-4099-2_31_5050-MCX354A-FCB_A2.bin -guid
1234567deadbeef burn
```

3. Update the firmware on the device, specifying the MACs to burn.

```
# flint -d /dev/mst/mt4099_pci_cr0 -i fw-4099-2_31_5050-MCX354A-FCB_A2.bin -mac
1234567deadbeef burn
```

4. Burn the image on a blank Flash device. This means that no GUIDs are currently burnt on the device, therefore they must be supplied (with -guid/-guids) by the burning command. Moreover, the burn process cannot be failsafe when burning a blank Flash, therefore the -nofs flag must be specified.

```
# flint -d /dev/mst/mt4099_pci_cr0 -i fw-4099-2_31_5050-MCX354A-FCB_A2.bin -nofs -guid
12345678 burn
```

5. Read FW from the device and save it as an image file.

```
# flint -d /dev/mst/mt4099_pci_cr0 ri Flash_Image_Copy.bin
```

6. MT48436 InfiniScale IV switch:

   Burn the image on a blank Flash device. This means that no GUIDs are currently burnt on the device, therefore they must be supplied (with -guid/-guids) by the burning command. Moreover, the burn process cannot be failsafe when burning a blank Flash, therefore the -nofs flag must be specified.

```
# flint -d /dev/mst/mtusb-1 -i /tmp/fw-is4.bin -nofs -guids 0002c9000100d060 0 0
0002c9000100d060 b
```

7. MT48436 InfiniScale IV switch inband firmware update:

```
# flint -d lid-0x18 -i /tmp/fw-is4.bin b
```

8. MT58100 SwitchX switch:

   Burn the image on a blank Flash device. Meaning, no GUIDs/MACs are currently burnt on the device, therefore they must be supplied (with -guid/-guids and -mac/-macs) by the burning command. Moreover, the burn process cannot be failsafe when burning a blank Flash, therefore the -nofs flag must be specified.

```
# flint -d /dev/mst/mtusb-1 -i /tmp/fw-sx.bin -nofs  -guids 000002c900002100 0 0
000002c900002100 -macs 0002c9002100 0002c9002101 b
```

9. MT58100 SwitchX switch inband firmware update:

```
# flint -d lid-0x18 -i /tmp/fw-sx.bin b
```

2.3.1.2.2 Querying the Firmware Image

- To query the FW image on a device, use the following command line:

```
# flint -d <device> q
```

- To query the FW image in a file, use the following command line:

```
# flint -i <image file> q
```

where:

device	Device on which the query is run.
image file	Image file on which the query is run.

Examples:

a. Query the FW on the device.

```
# flint -d /dev/mst/mt4099_pciconf0 query
```

b. Query the FW image file.

```
# flint -i 25408-2_30_5000-MCX354A-FCB_A2.bin query
```

2.3.1.2.3 Verifying the Firmware Image

- To verify the FW image on the Flash, use the following command line:

```
# flint -d <device> v
```

- To verify the FW image in a file, use the following command line:

```
# flint -i <image file> v
```

where:

device	Flash device to verify.
image file	Image file to verify.

Examples:

```
# flint -d /dev/mst/mt4099_pci_cr0 v
# flint -i ./image_file.bin v
```

2.3.1.2.4 Managing an Expansion ROM Image

1. To burn an Expansion ROM image, use the following command:

```
# flint -d <mst device> brom <image name>.mrom
```

The "brom" command installs the ROM image on the Flash device or replaces an already existing one.

Example:

```
# flint -d /dev/mst/mt4099_pci_cr0 brom example.mrom
                  Current ROM info on flash: N/A
                  New ROM info: type=PXE version=3.4.255 devid=4099 proto=VPI

                  Burning ROM image - OK
                  Restoring signature - OK
#
```

2. To read an Expansion ROM image to a file, use the following command:

```
# flint -d <mst device> rrom <image name>.rom
```

Example:

```
# flint -d /dev/mst/mt4099_pci_cr0 rrom example.mrom
# flint -d /dev/mst/mt4099_pci_cr0 q
    Image type:      FS2
    FW Version:      2.31.5050
    FW Release Date: 4.5.2014
    Rom Info:        type=PXE version=3.4.225 devid=4099 proto=VPI
    Device ID:       4099
    Description:     Node             Port1            Port2            Sys image
    GUIDs:           f45214030001b8a0 f45214030001b8a1 f45214030001b8a2 f45214030001b8a3
    MACs:                                 f4521401b8a1     f4521401b8a2
    VSD:
    PSID:            MT_1090120019
#
```

3. To remove the Expansion ROM, use the following command:

```
# flint -d <mst device> drom
```

Example:

```
 # flint -d /dev/mst/mt4099_pci_cr0 drom
  Removing ROM image   - OK
  Restoring signature  - OK
 #
```

2.3.1.3 Additional Debug / Production Commands

2.3.1.3.1 Setting GUIDs and MACs

To set GUIDs/MACs/UIDs for the given device, use the ‘sg’ (set guids) command with the -guid(s) -uid(s) and/or -mac(s) flags.

2.3.1.3.2 On 4th Generation Devices

On 4th generation devices, the “sg” command can operate on both the image file and the image on the flash. When running the “sg” command on an image on the flash, if the GUIDs/MACs/UIDs in the image are non-blank, the flint will re-burn the current image using the given GUIDs/MACs/UIDs.

1. Change the GUIDs/MACs on a device

```
# flint -d /dev/mst/mt4099_pciconf0 q
-W- Running quick query - Skipping full image integrity checks.

Image type:      FS2
FW Version:      2.31.5050
FW Release Date: 4.5.2014
Device ID:       4099
Description:     Node             Port1            Port2            Sys image
GUIDs:           f45214030001b8a0 f45214030001b8a1 f45214030001b8a2 f45214030001b8a3
MACs:                                 f4521401b8a1     f4521401b8a2
VSD:
PSID:            MT_1090120019

# flint -d /dev/mst/mt4099_pciconf0 -guid 0x452140300abadaba -mac 0x300abadaba sg

-W- GUIDs are already set, re-burining image with the new GUIDs ...
You are about to change the Guids/Macs/Uids on the device:
                          New Values              Current Values
        Node  GUID:     452140300abadaba        f45214030001b8a0
        Port1 GUID:     452140300abadabb        f45214030001b8a1
        Port2 GUID:     452140300abadabc        f45214030001b8a2
        Sys.Image GUID: 452140300abadabd        f45214030001b8a3
        Port1 MAC:          00300abadaba            f4521401b8a1
        Port2 MAC:          00300abadabb            f4521401b8a2
```

```
 Do you want to continue ? (y/n) [n] : y
Burning FS2 FW image without signatures - OK
Restoring signature                     - OK


# flint -d /dev/mst/mt4099_pciconf0 q
    Image type:      FS2
    FW Version:      2.31.5050
    FW Release Date: 4.5.2014
    Device ID:       4099
    Description:     Node             Port1            Port2            Sys image
    GUIDs:          452140300abadaba 452140300abadabb 452140300abadabc 452140300abadabd
    MACs:                                00300abadaba     00300abadabb
    VSD:
    PSID:            MT_1090120019
```

2. Change the GUIDs/MACs on an image file:

```
# flint -i /tmp/image.bin q


Image type:      fs2
FW Version:      2.31.5050
FW Release Date: 4.5.2014
    Device ID:       4099
    Description:     Node             Port1            Port2            Sys image
    GUIDs:          f45214030001b8a0 f45214030001b8a1 f45214030001b8a2 f45214030001b8a3
    MACs:                                00300abadaba     00300abadabb
    VSD:
    PSID:            MT_1090120019


# flint -i /tmp/image.bin -guid 0002c9000abcdef0 -mac 02c90abcdef0 sg
    You are about to change the Guids/Macs/Uids on the device:
                          New Values              Current Values
        Node  GUID:     0002c9000abcdef0        f45214030001b8a0
        Port1 GUID:     0002c9000abcdef1        f45214030001b8a1
        Port2 GUID:     0002c9000abcdef2        f45214030001b8a2
        Sys.Image GUID: 0002c9000abcdef3        f45214030001b8a3
        Port1 MAC:          02c90abcdef0            00300abadaba
        Port2 MAC:          02c90abcdef1            00300abadabb

Do you want to continue ? (y/n) [n] : y
Restoring signature                     - OK
# flint -i /tmp/image.bin q
    Image type:      FS2
    FW Version:      2.31.5050
    FW Release Date: 4.5.2014
   Device ID:       4099
   Description:     Node             Port1            Port2            Sys image
    GUIDs:          0002c9000abcdef0 0002c9000abcdef1 0002c9000abcdef2 0002c9000abcdef3
    MACs:                                02c90abcdef0     02c90abcdef1
    VSD:
    PSID:            MT_1090120019
```

2.3.1.3.3 5th Generation Devices

On 5th Generation devices, the “sg” command can operate on both the image file and the image on the flash. When running the “sg” command on an image on the flash, -uid flag must be specified. by default 8 guids will be assigned for each port starting from base, base+1 up until base+7 for port 1 and base+8 up until base+15 for port 2.

To change the step size and the number of guids per port specify guids_num=<num> step_size=<size> to the sg command.

1. Change GUIDs for device.

```
# flint -d /dev/mst/mt4113_pciconf0 q
Image type:      FS3
FW Version:      10.10.3000
FW Release Date: 29.4.2014
Description:     UID                GuidsNumber  Step
Base GUID1:      0002c903002ef500        8        1
Base GUID2:      0002c903002ef508        8        1
Base MAC1:       00000002c92ef500        8        1
Base MAC2:       00000002c92ef508        8        1
Image VSD:
Device VSD:      VSD
PSID:            MT_1240110019

# flint -d /dev/mst/mt4113_pciconf0 -uid 0002c123456abcd -ocr sg

-W- Firmware flash cache access is enabled. Running in this mode may cause the firmware
to hang.
Updating GUID section - OK
Updating ITOC section - OK
Restoring signature   - OK

# flint -d /dev/mst/mt4113_pciconf0 q
Image type:      FS3
FW Version:      10.10.3000
FW Release Date: 29.4.2014
Description:     UID                GuidsNumber  Step
Base GUID1:      00002c123456abcd        8        1
Orig Base GUID1: 0002c903002ef500        8        1
Base GUID2:      00002c123456abd5        8        1
Orig Base GUID2: 0002c903002ef508        8        1
Base MAC1:       000000002c56abcd        8        1
Orig Base MAC1:  00000002c92ef500        8        1
Base MAC2:       000000002c56abd5        8        1
Orig Base MAC2:  00000002c92ef508        8        1
Image VSD:
Device VSD:      VSD
PSID:            MT_1240110019
```

Orig Base GUID/MAC refers to the GUIDs/MACs located in the MFG(manufacture guids) section of the flash/image.

2. Change GUIDS for device (specifying guids_num and step_size).

```
# flint -d /dev/mst/mt4113_pciconf0 q
Image type:      FS3
FW Version:      10.10.3000
FW Release Date: 29.4.2014
Description:     UID                GuidsNumber  Step
Base GUID1:      0002c903002ef500        8        1
Base GUID2:      0002c903002ef508        8        1
Base MAC1:       00000002c92ef500        8        1
Base MAC2:       00000002c92ef508        8        1
Image VSD:
Device VSD:      VSD
PSID:            MT_1240110019

# flint -d /dev/mst/mt4113_pciconf0 -uid 0000000000000001 -ocr sg guids_num=2 step_-
size=1

-W- Firmware flash cache access is enabled. Running in this mode may cause the firmware
to hang.
Updating GUID section - OK
Updating ITOC section - OK
Restoring signature   - OK

# flint -d /dev/mst/mt4113_pciconf0 q
Image type:      FS3
FW Version:      10.10.3000
FW Release Date: 29.4.2014
Description:     UID                GuidsNumber  Step
Base GUID1:      0000000000000001        2        1
Orig Base GUID1: 0002c903002ef500        8        1
Base GUID2:      0000000000000003        2        1
Orig Base GUID2: 0002c903002ef508        8        1
Base MAC1:       0000000000000001        2        1
Orig Base MAC1:  00000002c92ef500        8        1
Base MAC2:       0000000000000003        2        1
Orig Base MAC2:  00000002c92ef508        8        1
Image VSD:
Device VSD:      VSD
PSID:            MT_1240110019
```

3. Change GUIDs for image.

```
# flint -i /tmp/connect-ib.bin q
Image type:      FS3
FW Version:      10.10.3000
FW Release Date: 29.4.2014
Description:     UID                GuidsNumber  Step
Base GUID1:      0002c903002ef500        8        1
Base GUID2:      0002c903002ef508        8        1
Base MAC1:       00000002c92ef500        8        1
Base MAC2:       00000002c92ef508        8        1
Image VSD:
Device VSD:      VSD
PSID:            MT_1240110019

# flint -i /tmp/connect-ib.bin -uid 000123456abcd sg
Updating GUID section - OK
Updating ITOC section - OK
Restoring signature   - OK

# flint -i /tmp/connect-ib.bin q
Image type:      FS3
FW Version:      10.10.3000
FW Release Date: 29.4.2014
Description:     UID                GuidsNumber  Step
Base GUID1:      000000123456abcd        8        1
Orig Base GUID1: 0002c903002ef500        8        1
Base GUID2:      000000123456abd5        8        1
Orig Base GUID2: 0002c903002ef508        8        1
Base MAC1:       000000000056abcd        8        1
Orig Base MAC1:  00000002c92ef500        8        1
Base MAC2:       000000000056abd5        8        1
Orig Base MAC2:  00000002c92ef508        8        1
Image VSD:
Device VSD:      VSD
PSID:            MT_1240110019
```

2.3.1.3.4 Preparing a Binary Firmware Image for Pre-assembly Burning

In some cases, OEMs may prefer to pre-burn the flash before it is assembled on board. To generate an image for pre-burning for 4th generation devices (ConnectX® and newer), use the mlxburn "-striped_image" flag. The "striped image" file layout is identical to the image layout on the flash, hence making it suitable for burning verbatim.

When pre-burning, the GUIDs/MACs inside the image should be unique per device. The following are two methods to pre-burn an image. You can choose the best method suitable for your needs.

Method 1: Pre-burn an Image with Blank GUIDs/MACs:

In this method, the image is generated with blank GUIDs and CRCs. The GUIDs are set after the device is assembled using the flint "sg" command. To set GUIDs take less than 1 second when running on an image with blank GUIDs (through a PCI device).

A device that is burnt with blank GUIDs/MACs will not boot as a functional network device as long as the GUIDs/MACs are not set.

Flow Example:

1. Generate a striped image with blank guids.

```
# mlxburn -fw ./fw-ConnectX3-rel.mlx -./MCX354A-FCB_A2-A5.ini -wrimage./fw-ConnectX3-
rel.bin -striped_image -blank_guids

-I- Generating image ...
-I- Image generation completed successfully.
```

2. Burn the image to a flash using an external burner.
3. (Optional) After assembly, query the image on flash to verify there are no guids on the device.

```
# flint -d /dev/mst/mt26428_pci_cr0 q

Image type:      FS2
FW Version:      2.31.5050
FW Release Date: 4.5.2014
Device ID: 4099
Description:     Node             Port1            Port2            Sys image
GUIDs:           ffffffffffffffff ffffffffffffffff ffffffffffffffff ffffffffffffffff
MACs:                                 ffffffffffffffff     ffffffffffffffff
VSD:             n/a
PSID:            MT_1090120019

-W- GUIDs/MACs values and their CRC are not set.
```

4. Set the correct GUIDs. Since the image is with blank GUIDs, this operation takes less than 1 second

```
# flint -d /dev/mst/mt4099_pci_cr0 -guid 0x0002c9030abcdef0 -mac 0x0002c9bcdef1 sg
```

5. Query the image on flash to verify that the GUIDs are set correctly.

```
# flint -d /dev/mst/mt4099_pci_cr0 q

Image type:      FS2
FW Version:      2.31.5050
FW Release Date: 4.5.2014
Device ID: 4099
Description:      Node             Port1            Port2            Sys image
GUIDs:            0002c9030abcdef0 0002c9030abcdef1 0002c9030abcdef2 0002c9030abcdef3
MACs:                                 0002c9bcdef1 0002c9bcdef2
VSD:              n/a
PSID:             MT_1090120019
```

Method 2: Pre-burn an Image with Specific GUIDs/MACs for Each Device:

In this method, a "base" image is generated with arbitrary default GUIDs and then updated with the correct guids for each device.

Example Flow:

1. Generate the base image with arbitrary default GUIDs

```
# mlxburn -fw ./fw-ConnectX3-rel.mlx -c ./MCX354A-FCB_A2-A5.ini -wrimage ./fw-Con-
nectX3-rel.bin -striped_image
```

2. Per device, set the device specific GUIDs in the image.

```
flint -i ./fw-ConnectX3-rel.bin -guid 0x0002c9030abcdef0 -mac 0x0002c9bcdef1 -
striped_image sg
```

3. (Optional) Query the image to verify the GUIDs are set. The “-striped_image” flag must be specified when querying a striped image.

```
# flint -i ./fw-ConnectX3-rel.bin -striped_image q
Image type: FS2
FW Version: 2.31.5050
FW Release Date: 4.5.2014
Device ID: 4099
Description:      Node             Port1           Port2           Sys image
GUIDs:            0002c9030abcdef0 0002c9030abcdef1 0002c9030abcdef2 0002c9030abcdef3
MACs:                                 0002c9bcdef1 0002c9bcdef2
VSD:              n/a
PSID:             MT_1090120019
```

Now the fw-ConnectX2-rel.bin image can be pre-burned to the flash. After the assembly the device would be fully functional.

2.3.1.3.5 Setting the VSD

To set the vsd for the given image/device(4th generation), use the 'sv' command with -vsd flag.

Example:

```
# flint -d /dev/mst/mt4099_pci_cr0 -vsd "MELLANOX" sv
Setting the VSD      - OK
Restoring signature  - OK

# flint -d /dev/mst/mt4099_pci_cr0 q
Image type:      FS2
FW Version:      2.31.5050
FW Release Date: 4.5.2014
Device ID:       4099
Description:     Node             Port1            Port2            Sys image
GUIDs:           f45214030001b8a0 f45214030001b8a1 f45214030001b8a2 f45214030001b8a3
MACs:            00300abadaba     00300abadabb
VSD:             MELLANOX
PSID:            MT_1090120019
```

2.3.1.3.6 Disabling/Enabling Access to the Hardware

The secure host feature enables ConnectX® family devices to block access to its internal hardware registers. The hardware access in this mode is allowed only if a correct 64 bits key is provided.

The secure host feature requires a MLNX_OFED driver installed on the machine.

Examples:

1. Set the key:

```
# flint  -d /dev/mst/mt4099_pci_cr0 set_key 22062011
Setting the HW Key   - OK
Restoring signature  - OK
```

A driver restart is required to activate the new key.

2. Access the HW while HW access is disabled:

```
# flint  -d /dev/mst/mt4099_pci_cr0 q
E- Cannot open /dev/mst/mt4099_pci_cr0: HW access is disabled on the device.
E- Run "flint -d /dev/mst/mt4099_pci_cr0 hw_access enable" in order to enable HW
access.
```

3. Enable HW access:

```
# flint  -d /dev/mst/mt4099_pci_cr0 hw_access enable
Enter Key: ********
```

4. Disable HW access:

```
# flint  -d /dev/mst/mt4099_pci_cr0 hw_access disable
```

WARNING:

4. Once a hardware access key is set, the hardware can be accessed only after the correct key is provided.
5. If a key is lost, there is no way to recover it using the tool. The only way to recover from a lost key is to:
6. - connect the flash-not-present jumper on the card.
7. - Boot in "flash recovery" mode.
8. - Re-burn FW
9. - Re-set the HW access key

For further details, please refer to Appendix H,“Secure Host Feature,” on page 96

2.3.1.3.7 Reading a Word from Flash

To read one dword from Flash memory, use the following command line:

```
# flint -d <device> rw addr
```

where:

device	The device the dword is read from.
addr	The address of the word to read.

Example:

```
# flint -d /dev/mst/mt4099_pci_cr0 rw 0x20
```

2.3.1.3.8 Writing a dword to Flash

To write one dword to Flash memory, use the following command line:

```
# flint -d <device> ww addr data
```

where:

device	The device the dword is written to.
addr	The address of the word to write.
data	The value of the word.

Example:

```
# flint -d /dev/mst/mt4099_pci_conf01 ww 0x10008 0x5a445a44
```

2.3.1.3.9 Writing a dword to Flash Without Sector Erase

To write one dword to Flash memory without sector erase , use the following command line:

```
# flint -d <device> wwne addr data
```

where:

device	The device the dword is written to.
addr	The address of the word to write.
data	The value of the word.

Example:

```
# flint -d /dev/mst/mt4099_pci_cr0 wwne 0x10008 0x5a445a44
```

Note that the result may be dependent on the Flash type. Usually, bitwise and between the specified word and the previous Flash contents will be written to the specified address.

2.3.1.3.10 Erasing a Sector

To erase a sector that contains a specified address, use the following command line:

```
# flint -d <device> e addr
```

where:

device	The device the sector is erased from.

addr — The address of a word in the sector that you want to erase.

Example:

```
# flint -d /dev/mst/mtusb-1 e 0x1000
```

2.3.1.4 Flint/mlxburn Limitations

When running flint/mlxburn via an MTUSB-1 device, a burn/query command may take up to 45 minutes to complete.

To accelerate the burn process add the flag `-no_flash_verify` to the command line which skips the flash verification step. This flag, however, does not verify if the image is burnt correctly.

Burning an image to a ConnectX®-3 adapter in Flash recovery mode may fail on some server types (that use PCIe spread spectrum). The tool may not be able to recognize the device's PCI CONF0 or the image burn may not complete successfully.

To burn the device, use the MTUSB-1 connection.

2.4 mlxburn - Firmware Image Generator and Burner

mlxburn is a tool for firmware (FW) image generation and/or for burning a firmware image to the Flash/EEPROM attached to a Mellanox device. Both functions or a single function of mlxburn can be activated by means of command line options (see Section 2.4.2, "mlxburn Synopsis"). It can also query for firmware attributes (e.g., firmware version, GUIDs, etc.) and VPD info of adapter cards and switch systems.

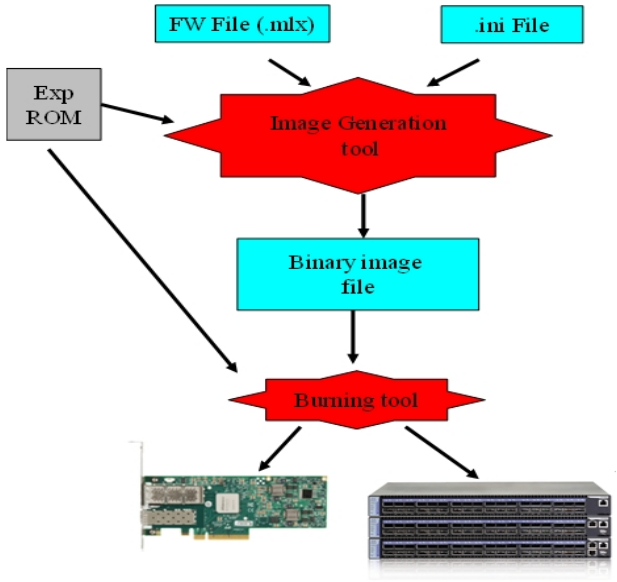
mlxburn allows for customization of standard Mellanox firmware for OEM specific needs (e.g., a specific adapter board type). See Section 2.4.1.1, "Firmware Customization", on page 50.

2.4.1 Firmware Generation and Burning with mlxburn

The **mlxburn** firmware update flow is composed of two separate stages: image generation and image burning. In the image generation stage, a given Mellanox firmware release (in .mlx format for adapters, bridges and 4th generation switches (ConnectX® and newer), and in .BIN file format for InfiniScale® III switches) is processed together with a board-specific configuration (.ini) file to generate a 'burnable' firmware image. This image is burnt to the Flash/EERPROM

attached to a Mellanox device in the second stage. The burning process retains device specific data such as GUIDs, UIDs, MACs, VSD, and BSN. Also, the burn process is failsafe by default.

Figure 2: FW Generation and Burning



mlxburn runs both stages by default, but it may perform only one by means of command options. If the '-wrimage' is specified (see Section 2.4.2, "mlxburn Synopsis"), only image generation is performed. Specifying the '-image' option skips the image generation stage and loads the provided image (generated in a previous run of **mlxburn** using the '-wrimage' option).

2.4.1.1 Firmware Customization

A Mellanox firmware image can be customized (usually) to fit a specific board type. The customization is done by using a FW parameter-set file in the image generation stage. This file has a .ini format. Each parameter-set file has a unique parameter-set ID (PSID), which is kept in the device Flash/EEPROM and allows retaining device configuration during future FW updates.

During a device FW update, **mlxburn** reads the PSID from the device and uses the corresponding .ini file when generating the FW image. **mlxburn** searches for the files in the same directory of the FW release. When **mlxburn** is used to generate an image file, or when no corresponding parameter-set file is found, the user should explicitly specify which parameter-set file to use.

To produce an image file the user needs to provide the option '-wrimage <target file>'. To actually burn the image to the Flash/EEPROM attached to a Mellanox adapter or switch device, the user needs to specify the option '-dev <mst device>' (see the synopsis section below).

If run in burning mode, **mlxburn** auto-detects the firmware parameter-set with which the device was previously burnt. It locates and uses this parameter-set file to generate the appropriate image for the device (by merging the FW release with the specific parameter-set required).

To inhibit image generation, the '-image <pre-generated-image-file>' should be used. It instructs **mlxburn** to use the given file for burning the device.

2.4.2 mlxburn Synopsis

```
# mlxburn [-h][-v] <-dev mst-device|-wrimage fw-image> <-fw mellanox-fw-file|-image fw-image|-img_dir img_direcory|-fw_dir fw_dir> [-conf_dir_list <dir1,dir2,...,dirn>][-conf fw-conf-file][-nofs][-nofs_img][-format BINARY|IMAGE][-dev_type device-type] [-exp_rom <exp_rom_file>][-exp_rom_dir <exp_rom_dir>][-force][-conf_dir <conf_dir>][-fwver[1]] [-vpd][-vpd_rw][-vpd_prog_rw <rw-keywords-file>][-vpd_set_keyword <keyword-assignment>] [-set_pxe_en <(port1|port2)=(enable|disable)>] [-query]
```

1. The "`-fwver`" flag is not supported in Connect-IB®/Switch-IB™ devices.

where:

-dev_type <mellanox-device-number>	mlxburn must know the device type in order to work properly Use this flag if device type auto-detection fails. Example: -dev_type 4099 Supported Mellanox device types: • HCAs/NICs: 25408, 25418, 26418, 26428, 25448, 26448, 26468, 26478, 25458, 26458, 26438, 26488, 4097, 4098, 4099, 4100, 4101, 4102, 4103, 4104, 4105, 4106, 4107, 4108, 4109, 4110, 4111, 4112. • Switches: 43132, 48436, 48437, 48438, 51000. • Bridges: 64102, 64122, 1016.
-fw <mellanox-fw-file>	Specify Mellanox FW released Firmware File to use (file extension is .mlx for HCA and BIN for an MT47396 switch).
-conf <parameter-set-file>	FW configuration file (.ini). Needed when generating image (not using -dev flag) or if configuration auto detection fails.
-conf_dir <dir>	When specified, the auto detected configuration files will be looked for in the given directory, instead of in the firmware file directory. Applicable for burn operation.
-dev <mst-dev>	Burn the image using the given MST device.
-exp_rom <exp-rom-file>	Integrate the given expansion rom file to the FW image. The given file may be in .img or bin/.rom (raw binary) format. • If the exp-rom-file is set to "AUTO", expansion rom file is auto detected from the files rom in the exp_rom_dir (see below). **NOTE:** Exp rom auto detection is done for devices that are already burned with an exp-rom image. • If "-exp_rom AUTO" is specified for a device with no exp-rom, it would be burnt with no exp rom. To add exp-rom to a device, manually supply the exp rom file to use.
-exp_rom_dir <exp_rom_dir>	The directory in which to look for expansion rom file when "-exp_rom AUTO" is specified. By default, exp-rom files are searched in <fw file directory>/exp_rom/*
-force	None interactive mode. Assume "yes" for all user questions.
-format <BINARY|IMAGE>	Specify which image format to use. Can be specified only with the -wrimage flag. Default is BINARY.

-fw_dir <dir>	When specified, the auto detected fw files will be looked for in the given directory. Applicable for burn operation.
-conf_dir_list <dir1,dir2,...,dirn>	When specified, the auto detected configuration files will be looked for in the given directories, instead of in the firmware file directory. Applicable for burn operation.
-fwver	• When a device is given: Display current loaded firmware version. • When a FW file is given (-fw flag): Display the file FW version. **Note:** The "`-fwver`" flag is not supported in Connect-IB® devices.
-h	Display a short help text
-image <fw-image-file>	Do not generate image. Use the given fw image instead.
-img_dir <image directory>	Do not generate image. Select the image to burn from the *.bin in the given directory.
-nofs	When specified, burn process will not be failsafe.
-nofs_img	When specified, generated image will not be failsafe, and burn process will not be failsafe.
-query	Query the HCA/Switch device for firmware details, e.g. Firmware Version, GUIDs etc. In addition to the above flags, Mlxburn can also accept the following flags/options, which are passed to the underlying burning tool: -banks -use_image_ps -skip_is -mac(s) -guid(s) -sysguid -vsd -ndesc -bsn -pe_i2c -se_i2c -is3_i2c -no -uid(s) -log -blank_guids -flash_params -allow_psid_change -no_flash_verify -use_image_rom -override_cache_replacement -use_image_guids See the flint tool documentation for HCA/4th gen switches/ Bridge burning options.
-v	Print version info and exit.
-V <INFORM|WARNING|DEBUG>	Set verbosity level. Default is WARNING.
-vpd[1,2]	Display the read only section of the PCI VPD (Vital Product Data) of the given device.
-vpd_prog_rw <rw-keywords-file>[1,2]	(**on Linux only**): Program the VPD-W tag (the writable section of the VPD) with the data given in the rw-keywords-file. File lines format: "KEYWORD = VALUE". In order to set binary data to a keyword, add ":BIN" to the keyword name. in this case, the data is a hexadecimal string of even length. Example file: V1 = MY-ASCII-KEYWORD V2:BIN = 1234abcd White spaces before and after VALUE are trimmed.

-vpd_rw[1,2]	(**on Linux only**): Display also the read/write section of the PCI VPD of the given device.
-vpd_set_keyword <keyword-assign-ment>[1,2]	Add or change a keyword value in the VPD-W tag (the writ-able section of the VPD) with the data given in the keyword-assignment string. The string format is identical to a line in the rw-keywords-file described above. Other keywords in the VPD-W tag are not affected by this operation.
-wrimage <fw-image-file>	Write the image to the given file.

1. The VPD query may not be enabled on certain board types. Also, VPD operations are available only for devices with a PCI interface.
2. Running multiple VPD access commands in parallel on the same device, by mlxburn or any other VPD access tool, may cause the commands to fail. VPD access commands should be run one at a time.

2.4.2.1 Production Options

These options are applicable for Mellanox Connect-IB® HCA only.

The following options are relevant when generating an image for initial burning. The image contains the VPD and the GUIDs that are in a read-only area on flash.

```
[ -vpd_r_file <vpd_r_file>] [ -base_guid <GUID>]
```

where:

-vpd_r_file <vpd_r_file>	Embed the given VPD Read-Only section in the generated image. The vpd_r_file should contain the vpd read only section and the first dword of the vpd write-able section. The file is in binary format, and its size must be a multiple of 4 bytes. Please refer to PCI base spec for VPD structure info.
-base_guid <GUID>	Set the given GUID as the image base GUID. The base GUID is used to derive GUIDs and MACs for the HCA ports. It is assumes that 16 GUIDs (base_guid to base_guid + 15) are reserved for the card.

2.4.2.2 Additional mlxburn Options

The following is a list of additional options. Please see Chapter 3, “flint – Firmware Burner” for the HCA options.[1]

```
[-use_image_ps] [-skip_is] [-mac(s)] [-guid(s)] [-sysguid] [-vsd] [-uid(s)] [-log] [-
blank_guids] [-flash_params] [-allow_psid_change] [-no_flash_verify] [-use_image_rom]
[-ocr] [-use_image_guids] [-bank]
```

1. The arguments of the -guids and -macs flags must be provided within quotation marks; for example, mlxburn -macs “0002c900001 0002c900002”

2.4.3 Examples of mlxburn Usage

2.4.3.1 Host Channel Adapter Examples

- To update firmware on an MT25408 ConnectX® adapter device with the configuration file (.ini) auto-detected, enter:

```
# mlxburn -fw ./fw-ConnectX3-rel.mlx -dev /dev/mst/mt4099_pci_cr0
```

- To generate a failsafe image file for the same adapter above without burning, enter:

```
# mlxburn -fw ./fw-ConnectX3-rel.mlx -conf ./MCX354A-FCB_A2-A5.ini -wrimage ./fw-
4099.bin#
```

- To update firmware on the same adapter above with the configuration file (.ini) explicitly specified, enter:

```
# mlxburn -fw ./fw-ConnectX3-rel.mlx -dev /dev/mst/mt4099_pci_cr0 -conf ./CX354A-
FCB_A2-A5.ini
```

2.4.3.2 SwitchX® Switch Examples

- Burn an MSX6025 switch system using the In-Band access method:

```
# mlxburn -dev /dev/mst/SW_MT51000_000002c900002100_lid-0x000E -fw ./fw-sx.mlx
```

- Generate an MT48436 image and perform an In-Band update of the device with LID 0x18:

```
# mlxburn -dev lid-0x000E -fw ./fw-sx.mlx
```

- Generate and burn a new MSX6025 via I2C:
  - Set the I2C network to access the InfiniScale IV switch.

```
# mlxi2c -d /dev/mst/mtusb-1 p SX
```

- Burn the new image (the flash is still blank) specifying the Node GUID, system GUID, base MAC and Switch MAC. Note that 4 guids (in quotes) should be specified as an argument to the -guids flag. The 2 middle GUIDs are ignored by SwitchX and should be set to 0.

```
# mlxburn -d /dev/mst/mtusb-1 -fw ./fw-sx.mlx -conf MSX6025F_A1.ini -guids
"000002c900002100 0 0 000002c900002100" -macs "0002c9002100 0002c9002101" -nofs
```

2.4.3.3 InfiniScale IV Switch Examples

- Burn an MTS3600 switch system via I2C:
  a. Set the I2C network to access the InfiniScale IV switch.

```
# mlxi2c -d /dev/mst/mtusb-1 p IS4_PRIM
```

  b. Burn

```
# mlxburn -dev /dev/mst/mtusb-1 -fw ./fw-IS4.mlx
```

- Burn an MTS3600 switch system using the In-Band access method:

```
# mlxburn -dev /dev/mst/SW_MT48438_lid-0x0003 -fw ./fw-IS4.mlx
```

- Generate and burn a new MTS3600 via I2C:
  a. Set the I2C network to access the InfiniScale IV switch.

```
# mlxi2c -d /dev/mst/mtusb-1 p IS4_PRIM
```

b. Burn the new image (the flash is still blank) specifying the Node and System GUIDs. Note that 4 guids (in quotes) should be specified as an argument to the -guids flag. The 2 middle GUIDs are ignored by the InfiniScale IV and should be set to 0.

```
# mlxburn -dev /dev/mst/mtusb-1 -fw ./fw-IS4.mlx -conf ./MTS3600Q-1UNC_A1.ini-guids
"0002c9000100d060 0 0 0002c9000100d060" -nofs
```

- Generate and Burn a new MT3600 switch system via I2C in 2 steps:

  a. Generate the image:

```
# mlxburn -fw ./fw-IS4.mlx -conf ./MTS3600Q-1UNC_A1.ini -wrimage ./fw-is4.bin
```

  b. Burn using flint tool:

```
# flint -d /dev/mst/mtusb-1 -i /tmp/fw-is4.bin -nofs -guids 0002c9000100d060 0 0
0002c9000100d060 b
```

- To generate an MT48436 image and perform an In-Band update of the device with LID 0x18, enter:

```
# mlxburn -fw ./fw-IS4.mlx -dev lid-0x18
```

2.4.3.4 BridgeX® Gateway Examples

- To update firmware on BridgeX® device with the configuration file (.ini) auto-detected, enter:

```
# mlxburn -d /dev/mst/mt64102_pci_cr1 -fw ./fw-BridgeX-rel.mlx
```

- To generate a failsafe image file for the same BridgeX above without burning, enter:

```
# mlxburn -fw ./fw-BridgeX-rel.mlx -conf ./MTB4020-PC0_A1.ini -wrimage ./fw-BridgeX.bin
```

- To update firmware on the same BridgeX above with the configuration file (.ini) explicitly specified, enter:

```
# mlxburn -fw ./fw-BridgeX-rel.mlx -dev /dev/mst/mt64102_pci_cr1-conf ./MTB4020-
PC0_A1.ini
```

- To burn a firmware binary file for a BridgeX device, enter:

```
# mlxburn -image ./fw-BridgeX.bin -dev /dev/mst/mt64102_pci_cr1
```

2.4.3.5 Connect-IB® Examples

- To generate a failsafe image file for Connect-IB® device without burning, enter:

```
# mlxburn -fw FW/fw-ConnectIB.mlx -c FW/MCB194A-FCA_A1.ini -wrimage fw-ConnectIB-
MCB194A-FCA_A1.bin -base_guid 0x0002c903002ef500
```

- To update firmware on a Connect-IB® device, enter:

```
# mlxburn -i fw-ConnectIB-MCB194A-FCA_A1.bin -d /dev/mst/mt4113_pciconf0 -
```

2.4.3.6 Switch-IB™ Examples

- To generate a failsafe image file for a Switch-IB™ device without burning, enter:

```
mlxburn -fw FW/fw-SwitchIB.mlx -c FW/MSB7700-E_Ax.ini -wrimage fw-SwitchIB-MSB7700-
E_Ax.bin -base_guid 0x0002c903002ef500
```

- To update firmware on a Switch-IB™ device, enter:

```
mlxburn -i fw-SwitchIB-MSB7700-E_Ax.bin -d /dev/mst/SW_MT52000_000011111101a24c_lid-
0x0006,mlx4_0,1
```

2.4.4 Exit Return Values

The following exit values are returned:

- 0 - successful completion
- >0 - an error occurred

2.5 Mlxfwreset - Loading Firmware on 5th Generation Devices Tool

Mlxfwreset (Mellanox firmware reset) tool enables the user to load updated firmware without having to reboot the machine.

Mlxfwreset supports 5th Generation devices (Connect-IB® and later) with ISFU supported Firmware. It is supported only on Linux.

The tool requires:

- OFED driver to be installed and enabled
- Access to device through configuration cycles (pciconf)
- Firmware supporting ISFU
  - Version 10_10_3000 and above
- Device's firmware updated with latest MFT burning tools (Flint/Mlxburn/Mlxfwmanager)
- Supported devices: Connect-IB

Exact reset level needed to load new firmware may differ, as it depends on the difference between the running firmware and the firmware we are upgrading to.

2.5.1 mlxfwreset Synopsis

```
# mlxfwreset -d <device>  [--level <0..5>] [-y] <query | reset>
```

where

-d|--device <device>	Device to work with.
-l|--level <0..5>	Run reset with the specified reset level.
-y|--yes	answer “yes” on prompt.
-v|--version	Print tool version.

-h|--help	show help message and exit.

Commands

query	Query for reset level required to load new firmware
reset	Execute reset Level.

2.5.1.1 Reset Levels

Reset levels depends on the extent of the changes introduced when updating the device's firmware. The tool will display the supported reset levels that will ensure the loading of the new firmware

Those reset levels are:

- 0: Full ISFU.
- 1: Driver restart (link/management will remain up).
- 2: Driver restart (link/management will be down).
- 3: Driver restart and PCI reset.
- 4: Warm reboot.
- 5: Cold reboot (performed by the user).

Full ISFU means that the transaction to the new firmware will be seamless.

When updating firmware make sure that flint/mlxburn recommends to run mlxfwreset in order to load new firmware. If this message is absent, a reboot will be required to load the new firmware.

2.5.2 Examples of mlxfwreset Usage

1. To query device reset level after firmware update use the following command line:

```
# mlxfwreset -d /dev/mst/mt4113_pciconf0 query
```

Supported reset levels for loading firmware on device, /dev/mst/mt4113_pciconf0:

Example:

```
0: Full ISFU                                          Not supported
1: Driver restart (link/management will remain up)    Not supported
2: Driver restart (link/management will be down)      Not supported
3: Driver restart and PCI reset                       Supported
4: Warm Reboot                                        Supported
5: Cold Reboot                                        Supported
```

2. To reset device in order to load new firmware, use the following command line:

```
# mlxfwreset -d /dev/mst/mt4113_pciconf0 reset
```

Example

```
3: Driver restart and PCI reset
Continue with reset?[y/N] y
-I- Stopping Driver                          -Done
-I- Sending Reset Command To Fw              -Done
-I- Resetting PCI                            -Done
-I- Starting Driver                          -Done
-I- FW was loaded successfully.
```

When running the reset command without specifying a reset level the minimal reset level will be performed.

3. To reset a device with a specific reset level to load new firmware, use the following command line:

```
# mlxfwreset -d /dev/mst/mt4113_pciconf0 -l 4 reset
```

```
Requested reset level for device, /dev/mst/mt4113_pciconf0:

4: Warm Reboot
Continue with reset?[y/N] y
-I- Sending reboot command to machine       -

The system is going down for reboot NOW!
```

2.5.3 mlxfwreset Limitations

The following are the limitations of mlxfwreset:

- Executing a reset level that is lower than the minimal level (as shown in query command) will yield an error and a reboot will be required in order to load the new firmware. Attempting to run the tool again will return an error.
- When updating the firmware of a device using flint /mlxburn/mlxfwmanager, it is required for the burning tool to update the new firmware in an ISFU manner in order to be able to run this tool. The user should make sure that the message: "`-I- To load new FW run mlxfwreset or reboot machine`" is present in the burning tool's output.

- After a successful reset execution, attempting to query or reset again will yield an error as the load new firmware command was already sent to the firmware.

2.6 mlxphyburn – Burning Tool for Externally Managed PHY

Mlxphyburn (Mellanox PHY burn) tool allows the user to burn firmware of an externally managed PHY.

The tool burns and verifies a pre-compiled binary PHY firmware image on the PHY's flash. It is supported only on Linux.

2.6.1 Tool Requirements

- ConnectX®-3/ConnectX®-3 Pro with an externally managed PHY
- A device that has access to the PHY flash module
- MLNX_OFED driver (if installed) should be down
- Access to the device through the PCI interface (pciconf/pci_cr)
- Firmware version that supports access to an externally managed PHY
  - Version 2_33_5000 and above

2.6.2 Mlxphyburn Synopsis

```
# mlxphyburn [-d <device>] -i <phy_fw_image> b[urn]|q[uery]
```

where

-d|--dev <device>	Device which has access to the PHY.
-i|--img <PHY_fw_image>	PHY firmware image.
-v|--version	Display version info.
--h|--help	Display help message.

Commands

b[urn]	Burn given PHY image on the device's PHY.
q[uery]	Query PHY FW on device.

If no device is specified, mlxphyburn will attempt to burn the PHY firmware image on all mst devices on the machine.

Burn Example:

```
# mlxphyburn -d /dev/mst/mt4099_pciconf0 -i Firmware_1.37.10_N32722.cld burn
-I- attempting to burn PHY Fw on device: /dev/mst/mt4099_pciconf0
-I- Burning...(Process might take a few minutes)
-I- Device burned and verified.
```

Query Example:

```
# mlxphyburn -d /dev/mst/mt4099_pciconf0 q
-I- attempting to burn PHY Fw on device: /dev/mst/mt4099_pciconf0
Flash Type   : Atmel AT25DF041A
FW version   : 1.37
Image ID     : 1.37.10 InterfaceMasters N32722 Apr 14, 2014 12:21:00
Image ROM ID : 0
```

3 Debug Utilities

3.1 fwtrace Utility

The fwtrace utility extracts and prints trace messages generated by the firmware running on 5th generation devices (Connect-IB® and above) iRISC.

These trace messages inform developers of software drivers about internal status, events, critical errors, etc. Trace messages generated by iRISCs are stored in the trace buffer. The trace buffer is located in host memory. The tool also supports mem free mode with which uses a device internal small buffer.

By default, the firmware does not print trace messages. Please contact your FAE for more details on how to enable firmware tracing.

Memory mode on Connect-IB® device is supported only by PCI mst devices.

3.1.1 Operation

1. Start the MST driver (mst start1 or mst restart1)
2. Enter the following command:

```
# fwtrace  [options...]
```

where:

-h|--help	Print this help message and exit
-d|--device	mst device name
-f|--fw_strings	Fw strings db file containing the FW strings
|--tracer_mode	Tracer mode [FIFO | MEM]
|--real_ts	Print real timestamps in [hh:mm:ss:nsec] format
-i|--irisc	Irisc name (See below for full list of irisc names)
-s|--stream	Run in streaming mode
-c|--cfg	HW tracer events cfg file
-S|--buf_size	HW tracer MEM buffer size in [MB]
--dump	Dump file name
-m|--mask	Trace class mask, use "+" to enable multiple classes or use integer format, e.g: -m class1+class2+... or 0xff00ff00
-l|--level	Trace level
v|--version	Print tool's version and exit

Device Specific Info:

Connect-IB®:

Irisc names: [i0, iron, i2, i3, i4, i5, i6, i7, all]

Trace classes:

DEBUG_INIT, INIT, ICM, ICM_FREE_LIST, ICM_BLOCK_ALLOC
CMD_IF, PHY_IB, PHY_RX_ADAP, PHY_EYE_OPN, PHY_COMMON
PHY_MANAGER, PHY_PLL, BLOCK_ALLOC, ICM_ACCESS, MAD
RXT_CHECKS, I2C, TRANSPORT, FW_LL, RX_ERRORS
DEBUG_TRACER, PROFILING, MANAGEMENT, FLASH, STEERING

Example:

```
# fwtrace -d mlx5_0 -i all -s
-I- Found FW string db cache file, going to use it
mlxtrace -d mlx5_0 -m MEM -c /tmp/itrace_8153.cfg  -S
-I-     Tracer Configuration:
-I-     ====================
-I-     Mode                                    : Collector
-I-     Activation Mode                         : Memory Mode
-I-     Memory Access Method                    : NA
-I-     Configuration File Path                 : /tmp/itrace_8153.cfg
-I-     Output file (Trace File) Path           : mlxtrace.trc
-I-     User Buffer Size                        : NA[MBytes]
-I-     Use Stream Mode                         : YES
-I-     Configure Only                          : NO
-I-     Only Snapshot (Skip Configuration Stage)  : NO
-I-     Continuous fill                         : NO
-I-     Print timestamp in [hh:mm:ss:nsec] format : NO
-I-     Output file for streaming               : STDOUT
-I-     Delay between samples                   : 0[usec]
-I-     ============================================
-I-     Device is: cib
-I-     Configuring Tracer...
-I-     Invalidating kernel buffer... (Press ^C to skip)
-I-     Done
-I-     Tracer was configured successfully
Device frequency: 276MHz
-I-     Starting event streaming...
Reading new events...
774774193803      I2       Mad received on port 1 - QP 0
774774215444      I2       process set_get_pkey_table on port=1 set_get_=0 block=1
774775079296      I2       Mad received on port 1 - QP 0
774775120645      I2       port_state changed from INIT to ARM
774775166315      I2       process set_get_port_info on port 1 set_get_: 1 status:0x0
774775335890      I2       Mad received on port 1 - QP 0
774775367205      I2       port_state changed from ARM to ACTIVE
774775410880      I2       process set_get_port_info on port 1 set_get_: 1 status:0x0
774786733806      I3       process MAD_IFC on port 1
774786744859      I3       process set_get_port_info on port 1 set_get_: 0 status:0x0
.
.
.
```

3.2 itrace Utility

The itrace utility extracts and prints trace messages generated by the firmware of a ConnectX® family adapter devices. These trace messages inform developers of software drivers about internal status, events, critical errors, etc., for each iRISC. Trace messages generated by iRISCs are stored in the trace buffer. The trace buffer is located in host memory for MemFree adapter cards (i.e., without on-board memory), and in adapter memory for adapter cards with on-board memory.

The utility is a command line application controlled by command line parameters. It prints trace messages in text format to the console.

3.2.1 Operation

In order to print the firmware traces, it is required that

- Debug firmware is burnt and loaded to the device
- The driver is up. Specifically, this means that
  - For adapters with on-board memory: The SYS_ENABLE command has been executed
  - For adapters without on-board memory (MemFree): The RUN_FW command has been executed
- The desired trace mask is set (see the -m flag below)

The MST driver must be started prior to running itrace tool. To start itrace:

1. Start the MST driver (mst start[1] or mst restart[1]).
2. Enter the following command:

```
# itrace [options...] IRISC_NAME
```

where:

IRISC_NAME	The iRISC for which traces are to be printed. This can be specified once anywhere in the command line as a special option without the leading hyphen. Run ‘itrace -h’ to get a list of iRISC names for each adapter device.
-h, --help	Displays help about itrace usage.
-m --mask=TRACE_MASK	Sets the Trace Mask.

To enable generating trace messages for an iRISC, the trace_mask register must be set according to the specifications in the device’s *Programmer’s Reference Manual*. Setting or clearing bits of the trace_mask register enables or disables, respectively, the generation of specific types of trace messages. The TRACE_MASK parameter must be a hexadecimal or decimal number and its value will be written into the trace_mask register. Changing trace_mask will not change or remove messages previously stored in the trace buffer, so disabled types of messages can still be displayed by itrace if they were previously generated.

-w, --wait	- Runs itrace in wait mode. itrace will exit only if you press <Ctrl-C>. This is not the default behavior of itrace. Without the -w option, itrace will exit if there have been no new traces in the last 0.5 seconds.

1. This step in not required in Windows.

-d, --d=DEVICE	- Specifies the name of the MST device driver for accessing the cr-space. The default value is:/dev/mst/mt4099_pci_cr0. To run itrace via the I2C interface, use this option to specify the following: --d=device, where the device is an I2C device (such as mtusb-1)
--nomap	- Sets itrace not to directly access memory (via memory mapping) for reading the trace buffer, but to use the adapter memory access Gateway instead. By default, itrace accesses the memory directly. If the cr-space device specified by the -d parameter is one of the I2C devices, -nomap is switched on.
--no-propel	- Sets itrace not to animate the propeller in wait mode (-w option). By default, animation is enabled.
-v, --version	- Prints the MFT version and exits
-c, --color	- Enables color in trace output
-D, --dump	- Dumps the trace buffer and exits. This option is useful for debugging itrace; it dumps the contents of the trace buffer in row format.

Typing **`--help`** at the command line displays manual pages describing the syntax of the itrace utility.

Example:

For Linux device names should be listed with the /dev/mst prefix. For Windows, no prefix is required.

```
# itrace -d /dev/mst/mt4099_pci_cr0 sx1
itrace: read memory (174712 bytes), each dot denotes 2048 bytes:
[.....................................................................................]
IRISC Trace Viewer (Mellanox InfiniHost), mft 3.7.0-42, built on Aug 12 2014, 17:39:15.
Git SHA Hash: 90825ce
FW Version: 2.31.5050 07/08/2014 18:11:29

(00000003 c1b59e4e) SCHD: exeqpc_valid2freed(0x0) vec_busy_valid=0x00000010
(00000004 dda895e4) SCHD: SQP:0x000400 exes_super_scheduler:busy_done
(00000005 dda89760) SCHD: writing QpState SQPSTATE_GOOD_IDLE!!!!
(00000006 dda89868) SCHD: exeqpc_valid2freed(0x0) vec_busy_valid=0x00000010
(00000007 dda97ccf) SCHD: SQP:0x000400 exes_super_scheduler:busy_
(00000008 dda97e47) SCHD: writing QpState SQPSTATE_GOOD_IDLE!!!!
(00000009 dda97f4f) SCHD: exeqpc_valid2freed(0x0) vec_busy_valid=0x00000010
(0000000a dda9a8f6) SCHD: SQP:0x000400 exes_super_scheduler:busy
(0000000b dda9aa6e) SCHD: writing QpState SQPSTATE_GOOD_IDLE!!!!
(0000000c dda9ab79) SCHD: exeqpc_valid2freed(0x0) vec_busy_valid=0x00000010
(0000000d ddaaadc1) SCHD: SQP:0x000400 exes_super_scheduler:busy_
(00000029 ddaee521) INFO: IPCdata[00]=0x01abcd0a(0000002a ddaee60c) INFO: IPC-
data[01]=0x00000014
(0000002b ddaee8ce) MAD: exes_mad: QPN=0x000000, nda_nds=0x7c58d014
(0000002c ddaee9f2) SCHD: SQP:0x000000 sqpc_access_db_algorithm: INC
(0000002d ddaef0d5) SCHD: exes_scheduler: try to insert
(0000002e ddaef2d9) SCHD: SQP:0x000000 exes_scheduler chosen
(0000002f ddaef6aa) SCHD: EXES_GO(0x0)..
```

3.3 mstdump Utility

The mstdump utility dumps device internal configuration registers. The dump file is used by Mellanox Support for hardware troubleshooting purposes. It can be applied on all Mellanox adapter devices, BridgeX® device and 4th generation switch devices.

3.3.1 Operation

The MST driver must be started prior to running mstdump tool. To start mstdump:

1. Start the MST driver (mst start[1] or mst restart[1]).
2. Enter an mstdump command that complies with the following command syntax:

```
# mstdump [-full] <mst device>  >  <dump file>
```

where the **-full** flag dumps all internal registers.

On BridgeX devices, using the -full flag may have undesired side-effects and require resetting the device.

1. This step in not required in Windows.

Example:

```
[root@mymach]# mstdump /dev/mst/mt4099_pci_cr0 > mt4099.dmp
```

This dumps the internal configuration data of the device into the file mt25408.dmp.

3.4 mlxi2c Utility

The mlxi2c utility provides a way to route the I2c bus to Mellanox 4th generation switches.

3.4.1 Operation

The MST driver must be started prior to running mlxi2c.

➢ ***To start mlxi2c:***

1. Start the MST driver (mst start[1] or mst restart).
2. Run mlxi2c with the following command line syntax:

```
# mlxi2c [switches...] <command> [parameters...]
```

[switches...] summary:

-d <device>	- MST i2c device name default: "/dev/mst/mtusb-1". Affected commands: all
-h	- Print this help information.
-v	- Print version and exit.

<command> summary:

p <i2c_component>	- Route the i2c path to the indicated i2c component.
scan	- Scan the i2c slave addresses

Examples:

1. Point to a SwitchX device.

```
# mlxi2c -d /dev/mst/mtusb-1 p SX
```

2. Point to an InfiniScale IV device to enable accessing it directly by firmware utilities.

```
# mlxi2c -d /dev/mst/mtusb-1 p IS4_PRIM
```

3. Display the addresses of all I2C-accessible devices.

```
# mlxi2c -d /dev/mst/mtusb-1 scan
```

3.5 i2c Utility

The i2c utility provides low level access to the I2C bus on any Mellanox switch platform, enabling the user to read or write data.

3.5.1 Operation

The MST driver must be started prior to running i2c tool. To start i2c:

1. Start the MST driver (mst start[1] or mst restart[1]).

1. This step in not required in Windows.

2. Run i2c with the following command line syntax:

```
# i2c [OPTIONS] <device> <cmd> <i2c_addr> <addr> [<data>]
```

where `[OPTIONS]` can be the following:

-h	– Prints this message.
-a <addr_width>	– Sets address width (in bytes) to the specified value. May be 0, 1, 2 or 4. Default: 1.
-d <data_width>	– Sets data width (in bytes) to the specified value. May be 1, 2 or 4. Default is 1.
-x <data_len>	– Presents each byte of data as two hexadecimal digits (such as 013C20343B). Note that this option is mutually exclusive with the "-d" option.

The remaining parameters are:

<device>	– Valid MST device.
<cmd>	– Command. May be "r[ead]" or "w[rite]".
<i2c_addr>	– I2C slave address.
<addr>	– Address (of length addr_width) inside I2C target device to read/write operation. Note that the <addr> value is ignored if <addr_witdh> = 0.
<data>	– Data (bytes of length data_width) to write to target device.

All parameters are interpreted as hexadecimal values.

Examples:

1. Read two bytes from address 0 of target I2C device at address 0x56:

```
# i2c -a 2 -d 2 /dev/mst/mtusb-1 r 0x56 0x00
0000
```

2. Write two bytes to the address above then read them:

```
# i2c -a 2 -d 2 /dev/mst/mtusb-1 w 0x56 0x00 0x1234
# i2c -a 2 -d 2 /dev/mst/mtusb-1 r 0x56 0x00
3412
```

3. Read (as separate) 16 bytes in hexadecimal format starting from address 0 of the target device above:

```
# i2c -a 2 -x 16 /dev/mst/mtusb-1 r 0x56 0x00
12340000000000000000000000000000
```

3.5.2 Exit Return Values

The following exit values are returned:

- 0 - successful completion
- >0 - an error occurred

3.6 mget_temp Utility

The mget_temp utility reads the hardware temperature from Mellanox Technologies devices with temperature sensors (all Mellanox devices), and prints the reading in Celsius degrees.

3.6.1 Operation

The MST driver must be started prior to running mget_temp. To run mget_temp:

1. Start the MST driver (mst start[1] or mst restart).
2. Run mget_temp with the following command line syntax:

```
# mget_temp [OPTIONS]
```

where [OPTIONS] are:

-h	- Print this message.
-d <dev>	- mst device name
--version	- Display version info

Example on how to read a device temperature:

```
# mget_temp -d dev/mst/SW_MT51000_0002c903007e76a0_lid-0x0002
```

3.7 mlxtrace Utility

The mlxtrace utility is used to configure and extract HW events generated by different units in Mellanox devices.The utility generates a dump ".trc" file which contains HW events that assist us with debug, troubleshooting and performance analysis. Events can be stored in host memory if driver is up or in a small on-chip buffer (always available) depending on the utility running mode. In order to run the utility it's required to have a configuration file first, this file should be provided by Mellanox representative.

A dump file "mlxtrace.trc" will be generated by end of run (file name can be controlled by "-o" flag), this file should be sent to Mellanox representative for further diagnostics/troubleshooting.

Memory mode on Connect-IB® device is supported only by PCI mst devices.

3.7.1 Operation

- The MST driver must be started prior to running the mlxtrace tool.
- For MEM buffer mode driver must be "up" also.
- Enter the following command:
  - mlxtrace [options]

-h, --help	Print help and exit

1. This step in not required in Windows.

-v, --version	Print version (default=off)
-p, --parse	Move to parser mode (default=off)

Mode: CollectMode

-d, --device=MstDev	Mst device
-m, --mode=Mode	Activation mode: FIFO - HW BUFFER , MEM - KERNELB, UFFER (possible values="FIFO", "MEM")
-a, --mem_access=MemMethod	Memory access method: OB_GW, MEM, DMEM, FMEM, VMEM (possible values="OB_GW", "MEM", "DMEM", "FMEM", "VMEM")
-c, --cfg=CfgFile	Mlxtrace configuration file
-o, --trc_file=TrcPath	Output TRC file path (default=`mlxtrace.trc')
-C, --config_only	Configure tracer and exit (default=off)
-n, --snapshot	Take events snapshot - this assumes previous run with --config_only (default=off)
-s, --buf_size=BufSize	User buffer size [MB] (default=`1')
-S, --stream	Don't save events to file parse it immediately (default=off)
--ignore_old_events	Ignore collecting old events (default=off)
-g, --continuous_fill	Do not stop recording (stopping only with ^C), keep filling user's buffer cyclicly (default=off)
--sample_delay=Delay	Delay between samples when polling new events in [usec] (default=`0')
--keep_running	Keep the HW tracer unit running after exit (default=off)

Mode: ParseMode

-i, --input=TrcFile	Input file (default=`mlxtrace.trc')
--csv_mode	Enable csv output format (default=off)
--print_ts	Print timestamp events (default=off)
-r, --real_ts	Print real timestamps in [hh:mm:ss.nsec] format (default=off)
--print_raw	Print event bytes in each line header (default=off)
--ts_format=format	Choose printed TS format hex/dec (possible values="hex", "dec" default=`dec')
--print_delta	Enable printing delta between events (in cycles) (default=off)
-f, --print_file=FilePath	Print parsed event to the given file and not to stdout
--enable_db_check	Enable events DB checks (default=off)

Examples:

```
# mlxtrace -d /dev/mst/mt4099_pci_cr0 -c connectx3.cfg -m MEM
```

this generates an "mlxtrace.trc" file.

```
# mlxtrace -d /dev/mst/mt4099_pci_cr0 -c connectx3.cfg -m MEM -s 100 -o connectx3.trc
```

this generates a "connectx3.trc" file with a maximal size of 100 MB.

3.8 mlxdump Utility

The mlxdump utility dumps device internal configuration data and other internal data (such as counters, state machines).

The data can be used by for hardware troubleshooting. It can be applied to all Mellanox adapter devices, BridgeX device and 4th generation switch devices.

The tool has 3 run modes: [fast | normal | full] while the default is "fast", the "full" mode dumps all available data but might run slower than normal and fast modes.

3.8.1 Operation

- The MST driver must be started prior to running mlxdump tool.
- **> mlxdump -d <mst dev> snapshot [options]**

  Where [OPTIONS] are:

  -o, --file: dump file name

  -m, --mode: run mode [fast | normal | full]

  -h, --help: Show help message

  Examples:

```
# mlxdump -d /dev/mst/mt4099_pci_cr0 snapshot
```

  This will generate "mlxdump.udmp" while running in fast mode.

```
# mlxdump -d /dev/mst/mt4099_pci_cr0 snapshot -m full
```

  This will generate "mlxdump.udmp" while running in full mode.

```
# mlxdump -d /dev/mst/mt4099_pci_cr0 snapshot -m normal -o mlxdump_13_1_2013.udmp
```

  This will generate **"mlxdump_13_1_2013.udmp"** while running in normal mode.

3.9 mlxmcg Utility

The mlxmcg tool displays the current multicast groups and flow steering rules configured in the device. Target users: Developers of Flow Steering aware applications.

This tool dumps the internal steering table which is used by the device to steer Ethernet packets and Multicast IB packets to the correct destination QPs.

Each line in the table shows a single filter and a list of destination QPs. Packets that match the filter are steered to the list of destination QPs.

mlxmcg is not supported against In-band device.

3.9.1 Operation

The MST driver must be started prior to running mlxmcg tool. To start mlxmcg:

1. [Optional for Windows OSs] Start the MST driver (mst start or mst restart).

2. Enter an mlxmcg command that complies with the following command syntax:

```
# mlxmcg  [OPTIONS]
```

Where [OPTIONS] are:

-h, --help	show this help message and exit
-d DEV, --dev=DEV	MST device to use, required
-f FILE, --file=FILE	MCG dump file to use (for debug)
-p PARAMS, --params=PARAMS	Mcg params, (MCG_ENTRY_SIZE, HASH_TABLE_SIZE, MCG_TABLE_SIZE), default is (64, 32768, 65536)
-q, --quiet	Do not print progress messages to stderr
-v, --version	Print tool version
-c, --hopcount	add hopCount column
-a, --advanced	show all rules

This will display all the current multicast groups and flow steering rules configured in the device.

Examples:

```
Command  : mlxmcg -d /dev/mst/mt4099_pci_cr0

MCG table size:  64 K entries, Hash size:  32 K entries, Entry size:  64 B
Progress: HHHHHLLLL
Bucket Index ID Prio Proto DQP Port VLAN  MAC SIP DIP I-MAC I-VLAN  VNI  L4 SPort DPort Next QPs
0 0  0 0    all     --           2 --    -- -- -- -- --      --   --    --    --     1009c  11
af9 fee0  0 5000 IPv6 -- ff0e:0000:0000:0000:0000:0000:e000:0001 - -- -- -- -- --    8012 SB
e3f e3f  0 5000   L2 --            2    --    01:80:c2:00:00:0e -- -- - -- -- -- -- -- 8012  40048
1139 1139 0 5000  L2 --           2    --    01:00:5e:00:00:01 -- -- - -- -- -- -- -- 8014  40048
26fc 26fc 0 5000  L2 --           2    --    ff:ff:ff:ff:ff:ff -- -- - -- -- -- -- -- 8018  40048
2a3e 2a3e 0 5000  L2 --           2    --    33:33:00:00:00:01 -- -- -- -- -- -- -- -- 801a  40048
4000 4000 0 0     all --          2    --    -- -- -- -- --      --   --    --    --  1009c  10
45d7 45d7 0 5000  L2 --           1    --    01:00:5e:00:00:fb -- -- -- -- -- -- -- -- 8000  4004a
4af9 fef8 0 5000  IPv6 --     ff0e:0000:0000:0000:0000:0000:e000:0001 -- -- -- -- -- -- 8002  SB
4e3f 4e3f 0 5000 L2      --       1    --    01:80:c2:00:00:0e -- -- -- -- -- -- -- -- 8002  4004a
5139 5139  0 5000 L2  --          1    --    01:00:5e:00:00:01 -- -- -- -- -- -- -- -- 8004  4004a
66fc 66fc  0 5000 L2 --           1    --    ff:ff:ff:ff:ff:ff -- -- -- -- -- -- -- -- 8008  4004a
6a3e   6a3e 0 5000 L2 --         1    --    33:33:00:00:00:01 -- -- -- -- -- -- -- -- 800a  4004a
734b   734b 0 5000 L2 --         1    --    33:33:e0:00:00:01 -- -- -- -- -- -- -- -- 800c  4004a
Duplicated MCGS:                                                                          Count
1000   1000  0 5000 L2 --       2 -- 00:02:c9:00:00:02 -- -- -- -- -- -- -- -- 8015 40048    2048
4002   4002  0 5000 L2 --      1 -- 00:02:c9:00:00:01 -- -- -- -- -- -- -- -- 8001 4004a    2046
16 Unique rules,  4108  Total


Index          QPs
================================================================================================
====================
fee0    40054  40055  40056  40057  40058  40059  4005a  4005b  4005c  4005d  4005e  4005f  40060
        40061  40062 40063  40064  40065  40066  40067  40068  40069  4006a  4006b  4006c  4006d
        4006e  4006f  40070  40071 40072  40073  40074  40075  40076  40077  40078  40079  4007a
        4007b
================================================================================================
====================
fef8    40054  40055  40056  40057  40058  40059  4005a  4005b  4005c  4005d  4005e  4005f  40060
        40061  40062 40063  40064  40065  40066  40067  40068  40069  4006a  4006b  4006c  4006d
        4006e  4006f  40070  40071 40072  40073  40074  40075  40076  40077  40078  40079  4007a
        4007b
================================================================================================
====================
```

3.10 pckt_drop Utility

The pckt_drop utility corrupts the next transmitted packet from a ConnectX® family adapter port.

3.10.1 Operation

The MST driver must be started prior to running the pckt_drop utility. To start the pckt_drop utility:

1. Start the MST driver (mst start or mst restart).

2. Run the pckt_drop with the following command line syntax:

-d, --device	Specify the mst device to configure. (Required.)
-h, --help	Print this help screen and exit.
-m, --mode	Specify operating mode. Supported modes are: EDP Inserts error on next transmitted data packet. (Default: `EDP'.)
-p, --port	Select which port to configure. Use `1'/`2' for port1/port2, respectively, or `b' for both. (Default: `b'.)
-v, --version	Print the application version and exit.

Example:

```
# pckt_drop -d /dev/mst/mt4099_pci_cr0 -p 1
```

The example above shows how to use the pckt_drop to corrupt a packet from port 1.

3.11 mlxuptime Utility

The mlxuptime is a Mellanox firmware which prints Mellanox devices' up time and measured/ configured frequency.

3.11.1 Operation

mlxuptime

```
  [-d] [-s] [-h] [-v]
```

where:

-d	Mst device name
-s	Sampling interval for measuring frequency (default: 1 [sec])
-h	Print help and exit
-v	Print tool version and exit

3.11.2 mlxuptime Example

- Print all info

```
 # mlxuptime -d /dev/mst/mt4099_pci_cr0
Measured core frequency       : 427.099818 MHz
Device up time                : 10:01:20.456344 [h:m:s.usec]
```

- Print the uptime and configured frequency only

```
# mlxuptime -d /dev/mst/mt4099_pci_cr0 -m
Configured core frequency     : 427.083333 MHz
Device up time                : 53:31:00.162464 [h:m:s.usec]
```

3.12 wqdump Utility

The wqdump utility dumps device internal work queues. A work queue is an object containing a Queue Pair Context (QPC) which contains control information required by the device to execute I/O operations on that QP, and a work queue buffer which is a virtually-contiguous memory buffer allocated when creating the QP.

The dumped data can be used for hardware troubleshooting. It can be applied on ConnectX® and Connect-IB® Mellanox adapter devices.

wqdump on a ConnectX® device is not supported against in-band devices.

3.12.1 Operation

The MST driver must be started prior to running the wqdump utility.

To start the wqdump utility:

1. Start the MST driver (mst start or mst restart).
2. Run wqdump.

WQDump

```
# wqdump <-d|--device DeviceName> <--source ContextType> [--gvmi Gvmi] [--qp Context-
Number] <--dump DumpType> [--fi StartIndex] [--num NumberOfItems] [--format Format]
[--address Address] [--size Size] [-v|--version] [-h|--help] [--clear_semaphore]
```

where:

--d|--device DeviceName	Device name
--source ContextType	Type of context to dump. Options are: Snd, Rcv, Cmp, Srq, Eqe, connect-X :MCG,connect-IB:MKC, SXDC, FullQp
--gvmi Gvmi	Guest VM ID (connect-IB only)
--qp ContextNumber	context number to dump
--dump DumpType	Dump Type. Options are: WQ, QP, WQ_QP, ALL_QPC, ALL_VALID_QPNS, ICM
--fi StartIndex	Index of first element to dump, (Default:0)
--num NumberOfItems	Number of elements to dump from buffer, (Default: keep reading)
--format Format	Output format: options are : text, raw, dw, (Default: text)
--address Address	Memory Address
--size Size	Memory size in bytes
-v|--version	Show tool version and exit
-h|--help	Show usage
--clear_semaphore	force clear semaphore

3.12.2 wqdump Example

- Print all valid qpns

  The example below will dump all valid qpns of type mcg context.

  ```
  # wqdump -d /dev/mst/mt4099_pci_cr0 --source mcg --dump ALL_VALID_QPNS
  ```

- Dump mcg qp

The example below will dump mcg context number 0x10.

```
# wqdump -d /dev/mst/mt4099_pci_cr0 --source mcg --dump QP -qp 0x10
```

- Dump other qpns

  The example below will dump snd context number 0x10 in a raw format.

```
# wqdump -d /dev/mst/mt4099_pci_cr0 --source snd  --dump QP -qp 0x10  --format raw
```

- Dump wq

  The example below will dump send work queue buffer number 0x42.

```
# wqdump -d /dev/mst/mt4099_pci_cr0 --source snd --dump wq -qp 0x42
```

3.13 Mlxmdio Utility

The mlxmdio tool is used to read/write MDIO registers (Clause 45) on Boards with externally managed PHY.

3.13.1 Operation

To run mlxmdio, use the following line:

```
# mlxmdio <-d mst_dev> <-m phy_addr:dev_addr> <-a addr[:data]> [-g mdio_gw]
```

where:

-d <device>	mst device
-m <mdio_id>	The mdio id of the target device in phy_addr:dev_addr format.
-a <addr[:data]>	Access a single MDIO reg. If data is specified, the reg is written, Otherwise, it is read. Addr and data should be in hex format.
-g <mdio_gw>	Select which mdio gw <0 or 1> to use. (Default is 0).
-h	Show usage.
-v	Show tool version.

3.13.1.1 Methods for sending MDIO Transactions:

Mlxmdio will attempt to send the MDIO transaction through a firmware interface if supported (on supported devices only) if the firmware interface is not supported by the device, the tool by default will attempt to send the transaction through the mdio gateway (default is 0). If -g <0|1> flag is specified, the tool will attempt to send the MDIO transaction through the specified gateway.

Note: Sending MDIO transactions via FW requires specification of the PCI device.

3.13.2 mlxmdio Example

1. To read mlxmdio register, run the following command:

```
# mlxmdio -d /dev/mst/mt4099_pciconf0 -m 0x2:0x1 -a 0x0
4081
```

2. To write mlxmdio register, run the following command:

```
# mlxmdio -d /dev/mst/mt4099_pciconf0 -m 0x2:0x1e -a 0x103:0x1
```

3. To read mlxmdio register through gateway, run the following command:

```
# mlxmdio -d /dev/mst/mt4099_pciconf0 -m 0x0:0x1 -a 0x3 -g 0
688b
```

4 Troubleshooting

You may be able to easily resolve the issues described in this section. If a problem persists and you are unable to resolve it yourself please contact your Mellanox representative or Mellanox Support at support@mellanox.com.

4.1 General Related Issues

Issue	Cause	Solution
Adapter is no longer identified by the operating system after firmware upgrade	Happens due to burning the wrong firmware on the adapter, firmware corruption or adapter's hardware failure.	Power cycle the server. If the issue persists, extract the adapter and contact Mellanox Support
Server is booting in loop/not completing boot after performing adapter firmware upgrade	Happens due to burning the wrong firmware on the adapter, firmware corruption or adapter's hardware failure.	Extract the adapter and contact Mellanox Support
Connect-IB is represented with only one mst device (/dev/mst/mt4113_pciconfx) in the output of mst status	For Connect-IB adapter, there is only one method available for accessing the hardware and it is represented by the /dev/mst/mt4113_pciconfx mst device	When querying the Connect-IB adapter, use the /dev/mst/mt4113_pciconfx mst device.
enabling hardware access after configuring new secure host key, fails	The new configuration of the secure host key was not loaded by the driver	Restart the driver before enabling the hardware access again
Server not booting after enabling SRIOV with high number of VFs	Setting number of VFs larger than what the Hardware and Software can support may cause the system to cease working	To solve this issue: 1. Disable SRIOV in bios 2. Reboot server 3. Change num of VFs 4. Enable SRIOV in bios

4.2 Installation Related Issues

Issue	Cause	Solution
Unable to install MFT package on ESXi platform and the following message is printed on the screen: `Got no data from process`	Insufficient privileges	1. Copy the MFT package to /var/log/vmware and continue with the installation. If the issue persists, reboot the ESX server and try again 2. Use full file path of the MFT package **Note**: an additional reboot will be required after completing the installation

4.3 Firmware Burning Related Issues

Issue	Cause	Solution
The following message is printed on screen when trying to query/burn a Connect-IB device: `-E- Cannot open Device: /dev/mst/mt4113_pciconf0. B14 Operation not permitted MFE_CMDIF_GO_BIT_BUSY`	Using an outdated firmware version with the Connect-IB adapter.	1. Unload MLNX_OFED driver: `/etc/init.d/openibd stop.` 2. Add "-ocr" option to the 'flint' command. For example: `flint -d /dev/mst/mt4113_pciconf0 -ocr q`
The following message is reported on screen when trying to remove the expansion ROM using the 'drom' option: `-E- Remove ROM failed: The device FW contains common FW/ROM Product Version - The ROM cannot be removed separately.B9`	Updating only the EXP_ROM (FlexBoot) for recent firmware images which requires adding the 'allow_rom_change' option.	Allow "-allow_rom_change" option to the "flint" command. For example: `flint -d <mst_device> -allow_rom_change drom`

Generating a firmware image file on Windows fails and the following message is printed on screen:
`-E- File: C:/Users/Administrator/ps.ini, Line: 1 - Invalid syntax`
`-E- Image generation failed: child process exited abnormally`
	Using a firmware configuration file (.ini) which was generated by PowerShell text redirection: `flint -d <mst_device> dc > <fw_conf_file>.ini`	Generate the firmware configuration file (.ini) using CMD edit and continue with generating the firmware image file.

Issue	Cause	Solution
Burning command fails and the following message is printed on screen: `-E- Can not open 06:00.0: Can not obtain Flash semaphore (63). You can run "flint -clear_semaphore -d <device>" to force semaphore unlock. See help for details.`	Semaphore can be locked due to: • Another process is burning the firmware at the same time • Failure in the firmware boot • Burning process was forcefully killed	If no other process is taking place at the same time run the following command: `flint -d <device> --clear_semaphore` OR Reboot the machine.

Appendix A: PSID Assignment

In some cases, OEMs or board manufacturers may wish to use a specific FW configuration not supplied by Mellanox. After setting the new FW parameters in an INI file, the user should assign a unique PSID (Parameter Set ID) to this new configuration. The PSID is kept as part of the FW image on the device NVMEM. The firmware burning tools use this field to retain FW settings while updating FW versions.

This appendix explains how to assign a new PSID for a user customized FW, and how to indicate to the burning tools that a new PSID exists.

Please change FW parameters with caution. A faulty setting of FW parameters may result in undefined behavior of the burnt device.

A.1 PSID Field Structure

The PSID field is a 16-ascii (byte) character string. If the assigned PSID length is less then 16 characters, the remaining characters are filled with binary 0s by the burning tool.

Table 4 provides the format of a PSID.

Table 4 - PSID format

Vendor symbol	Board Type Symbol	Board Version Symbol	Parameter Set Number	Reserved
3 characters	3 characters	3 characters	4 characters	3 characters (filled with '\0')

Example:

A PSID for Mellanox's MHXL-CF128-T HCA board is MT_0030000001, where:

MT_	Mellanox vendor symbol
003	MHXL-CF128-T board symbol
000	Board version symbol
0001	Parameter Set Number

A.2 PSID Assignment and Integration Flow

To assign and integrate the new PSID to produce the new FW

1. Write the new FW configuration file (in .INI format).
2. Assign it with a PSID in the format described above. Use your own vendor symbol to assure PSID uniqueness.
   If you do not know your vendor symbol, please contact your local Mellanox FAE.
3. Set the PSID parameter in the new FW configuration file.

Appendix B: Flow Examples - mlxburn

To update an MT48436 InfiniScale® IV switch device having a specific GUID (for example, 0002c90200415190) or LID, the following are the recommended steps to update the device firmware.

For Linux device names should be listed with the /dev/mst prefix. For Windows, no prefix is required.

1. Make sure all subnet ports are in the active state. One way to check this is to run *opensm*, the Subnet Manager.

```
[root@mymach]> /etc/init.d/opensmd start
opensm start      [  OK  ]
```

2. Make sure the local ports are active by running ‘ibv_devinfo’.
3. Obtain the device LID. There are two ways to do that:
   a. Using the “mst ib add” command:

      The “mst ib add”runs the ibdiagnet/ibnetdiscover tool to discover the InfiniBand fabric and then lists the discovered IB nodes as an mst device. These devices can be used for access by other MFT tools.

```
[root@mymach]> mst ib add
-I- Discovering the fabric - Running: /opt/bin/ibdiagnet -skip all
-I- Added 3 in-band devices
```

      To list the discovered mst inband devices run “mst status”.

```
[root@mymach]> mst status
MST modules:
------------
    MST PCI module loaded
    MST PCI configuration module loaded

...

Inband devices:
-------------------
/dev/mst/CA_MT25418_sw005_HCA-1_lid-0x0001
/dev/mst/SW_MT47396_lid-0x0011
/dev/mst/SW_MT48438_lid-0x0003
[root@mymach]>
```

b. Using the ibnetdiscover tool, run:

```
ibnetdiscover | grep 0002c90200415190 | grep -w Switch
Switch  36 "S-0002c90200415190"         # "Infiniscale-IV Mellanox Technologies" base
port 0 lid 3 lmc 0
```

The resulting LID is given as a decimal number.

1. Run *mlxburn* with the LID retrieved in step #3 above to perform the In-Band burning operation.

   Burn the InfiniScale® IV switch:

```
[root@mymach]> mlxburn -d /dev/mst/SW_MT48438_lid-0x0003 -fw ./fw-IS4.mlx
-I- Querying device ...
-I- Using auto detected configuration file: ./MTS3600Q-1UNC_A1.ini (PSID = MT_0C20110003)
-I- Generating image ...

*** WARNING *** Running quick query - Skipping full image integrity checks.

Current FW version on flash: 7.0.135
New FW version:              7.0.138

Burning second FW image without signatures - OK
Restoring second signature                 - OK
-I- Image burn completed successfully.
```

Appendix C: In-Band Access to Multiple IB Subnets

In most cases, an adapter is connected to a single InfiniBand subnet. The LIDs (InfiniBand Local IDs) on this subnet are unique. In this state, the device access MADs are sent (to the target LID) from the first active port on the first adapter on the machine.

In case that the different IB ports are connected to different IB subnets, source IB port on the local host should be specified explicitly.

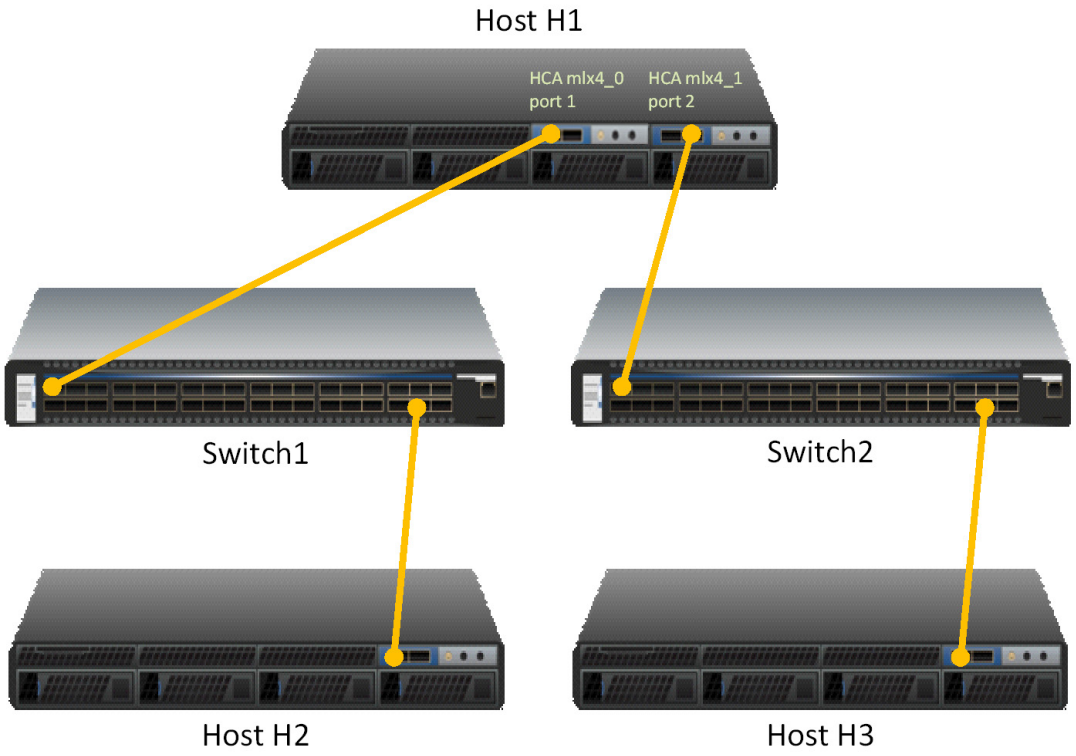
The device name would be in the format:

```
<any-string>lid-<lid-number>[,source adapter name][,source IB port number]
```

For example:

- On Linux: lid-3,mlx4_0,1
- On Windows: lid-3,0,1

Say we have the following setup:



H1 host has 2 adapters. Port 1 of the first adapter is connected to Switch 1, and port 2 of the second adapter is connected to Switch 2. Since the 2 adapters on the H1 are not connected to the each other, there are 2 separate IB subnets in this setup.

Subnet1 nodes: H1 Switch 1 and H2

Subnet2 nodes: H1 Switch 2 and H3

Running "ibv_devinfo" command on H1 would list the 2 adapter names. For ConnectX® adapters, the names would be mlx4_0 and mlx4_1.

Running "mst ib add" would add ib devices from the default port (first active port on the first adapter) - only Subnet1 nodes would be listed.

To add the nodes of the second subnet, the source adapter and port should be specified to the "mst ib add" command in the following format:

```
# mst ib add <hca_name> <hca_port>
```

Example:

1. Add nodes of both subnets, Run:

```
# mst ib add mlx4_0 1
# mst ib add mlx4_1 2
```

2. List the devices:

```
# mst status
...
/dev/mst/CA_MT25418_H1_HCA-1_lid-0x0001,mlx4_0,1
/dev/mst/CA_MT25418_H2_HCA-1_lid-0x0005,mlx4_0,1
/dev/mst/SW_MT51000_Switch1_lid-0x0003,mlx4_0,1

/dev/mst/CA_MT25418_H1_HCA-1_lid-0x0010,mlx4_1,2
/dev/mst/CA_MT25418_H3_HCA-1_lid-0x0012,mlx4_1,2
/dev/mst/SW_MT51000_Switch2_lid-0x0005,mlx4_1,2
```

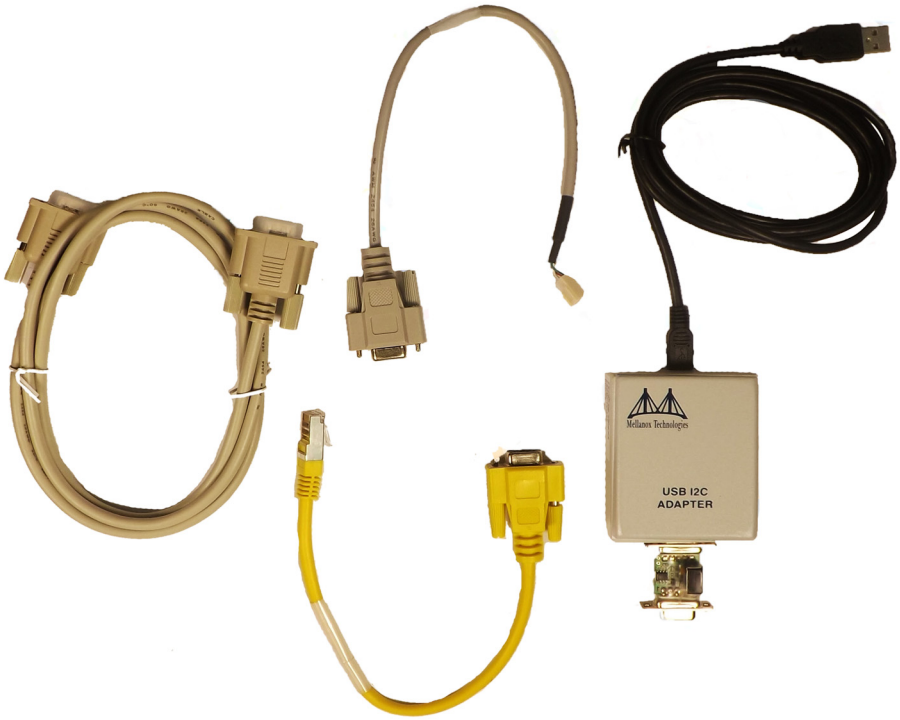
You can use the above device names with the MFT tools.

Appendix D: MTUSB-1 USB to I2C Adapter

D.1 Overview

The MTUSB-1 is a USB to I^2C bus adapter. This chapter provides the user with hardware and software installation instructions on machines running Linux or Windows operating systems.

Figure 3: MTUSB-1 Device



D.1.1 Package Contents

Please make sure that your package contains the items listed in Table 5 and that they are in good condition.

Table 5 - MTUSB-1 Package Contents

Item	Quantity	Description
MTUSB-1 device	1	USB to I^2C bus adapter
USB cable	1	USB_A to USB_B (1.8m)
I2C cable	1	9-pin male-to-male cable (1.5m)
Converter cable	2	9-pin female to 3-pin (small/large) (0.3m)

D.1.2 System Requirements

The MTUSB-1 is a USB device which may be connected to any Personal Computer with a USB Host Adapter (USB Standard 1.1 or later) and having at least one USB connection port.

D.1.3 Supported Platforms

MTUSB-1 supports the same platforms that are supported by the MFT tools package.

D.2 Hardware Installation

To install the MTUSB-1 hardware, please execute the following steps in the *exact* order:

1. Connect one end of the USB cable to the MTUSB-1 and the other end to the PC.
2. Connect one end of the I2C cable to the MTUSB-1 and the other end to the system/board you wish to control via the I2C interface. If the system/board uses a 3-pin connector instead of a 9-pin connector, connect the appropriate converter cable as an extension to the I2C cable on the 9-pin end, then connect its 3-pin end to the system/board.

D.3 Software Installation

The MTUSB-1 device requires that the Mellanox Firmware Tools (MFT) package be installed on the machine to which MTUSB-1 is connected – see Section 1.3,“MFT Installation,” on page 12 of this manual for installation instructions.

For a Windows machine, it is also required to install the MTUSB-1 driver – visit http://www.dio-lan.com to download this driver. This driver is required for the first use of the MTUSB-1 device.

Once you have the requirements installed, you may verify that your MTUSB-1 device is detected by MFT software as described below.

1. Start the *mst*[1] driver. Enter:

```
# mst start          (or mst restart if mst start was run earlier)
```

2. To obtain the list of *mst* devices, enter:

```
# mst status
```

If MTUSB-1 has been correctly installed, **“mst status”** should include the following device in the device list it generates:

- On Linux: /dev/mst/mtusb-1
- On Windows: mtusb-1

1. This step in not required in Windows.

Appendix E: Remote Access to Device by Sockets

E.1 Overview

The MST device on a machine can be accessed (server side) remotely for debugging purposes using the minimum set of tools from another machine (client side) which may have more tools or faster machine.

To do so:

- The MST server should run on the 'server side machine. Run: 'mst server start'
- The client side should add the MST 'server side'. Run: 'mst remote add <server side machine IP>'

After remote devices are added to the MST list device in the 'client side', you can run any tool that accesses the MST devices of the 'server side' as seen in the example below

Usage of relevant command:

Command	Description
mst server start [port]	Starts MST server to allow incoming connection. Default port is 23108
mst server stop	Stops MST server.
mst remote add <host-name>[:port]	• Establishes connection with a specified host on a specified port (default port is 23108). • Adds devices on remote peer to local the devices list. • <hostname> may be host name as well as an IP address.
mst remote del <host-name>[:port]	Removes all remote devices on a specified hostname. <host-name>[:port] should be specified exactly as in the "mst remote add" command.

Example:

The example below shows how to query the firmware of a device in the server side (machine: mft) from the client side (machine: mft1)

1. Run mst status in the server side:

```
[root@mft ~]# mst status
MST modules:
------------
    MST PCI module loaded
    MST PCI configuration module loaded

MST devices:
------------
/dev/mst/mt26428_pciconf0        - PCI configuration cycles access.
                                 domain:bus:dev.fn=0000:0b:00.0 addr.reg=88 data.reg=92
                                   Chip revision is: B0
/dev/mst/mt26428_pci_cr0         - PCI direct access.
                                   domain:bus:dev.fn=0000:0b:00.0 bar=0xd2600000
size=0x100000
                                   Chip revision is: B0
/dev/mst/mtusb-1:                - USB to I2C adapter as I2C master
```

2. Start the MST server in the 'server side':

```
[root@dev-l-vrt-059-005 ~]# mst server start
```

3. Add MST remote device in the client side:

```
[root@dev-l-vrt-059-006 ~]# mst remote add dev-l-vrt-059-005
```

4. Show the MST device in the 'client side' which contains remote devices for the 'server side' machine:

```
[root@mft1 ~]# mst status
MST modules:
------------
    MST PCI module loaded
    MST PCI configuration module loaded

MST devices:
------------
/dev/mst/mt4099_pciconf0         - PCI configuration cycles access.
                                 domain:bus:dev.fn=0000:0b:00.0 addr.reg=88 data.reg=92
                                   Chip revision is: 01
/dev/mst/mt4099_pci_cr0          - PCI direct access.
                                   domain:bus:dev.fn=0000:0b:00.0 bar=0xd2600000
size=0x100000
                                   Chip revision is: 01

Remote MST devices:
-------------------
/dev/mst/mft:23108,@dev@mst@mt26428_pciconf0
                                   Chip revision is: B0
/dev/mst/mft:23108,@dev@mst@mt26428_pci_cr0
                                   Chip revision is: B0
/dev/mst/mft:23108,@dev@mst@mtusb-1
```

5. Access a remote MST device from the 'client side':

```
[root@mft1 ~]# flint -d /dev/mst/mft:23108,@dev@mst@mt4099_pci_cr0 q
Image type:      FS2
FW Version:      2.32.1092
FW Release Date: 17.8.2014
Rom Info:        type=PXE version=3.4.300 devid=4099 proto=VPI
Device ID:       4099
Description:     Node             Port1            Port2            Sys image
GUIDs:           0002c90300e6e4e0 0002c90300e6e4e1 0002c90300e6e4e2 0002c90300e6e4e3
MACs:                                 0002c9e6e4e1     0002c9e6e4e2
VSD:             n/a
PSID:            MT_1090120019
```

Appendix F: Accessing Remote InfiniBand Device by Direct Route MADs

➢ ***To access a SwitchX® switch or Connect-IB® device remotely by direct route MADs:***

1. Make sure the local ports are connected to a node or more.

```
# ibstat
```

or

```
# ibv_devinfo
```

2. Obtain the device direct route path.

```
# mst ib add  --use-ibdr --discover-tool ibnetdiscover mlx5_0 1
-I- Discovering the fabric - Running: ibnetdiscover -s -C mlx5_0 -P 1
-I- Added 2 in-band devices
```

3. List the discovered direct route device.

```
# mst status
MST modules:
------------
    MST PCI module loaded
    MST PCI configuration module loaded
MST devices:
------------
….
Inband devices:
-------------------
/dev/mst/CA_MT4113_server1_HCA-3_ibdr-0,mlx5_0,1
/dev/mst/SW_MT51000_switch1_ibdr-0.2,mlx5_0,1
```

4. Run any tool against the devices above.

```
# flint -d /dev/mst/CA_MT4113_server1_HCA-3_ibdr-0,mlx5_0,2 v
FS3 failsafe image
     /0x00000038-0x00000f4f (0x000f18)/ (BOOT2) - OK
     /0x00201000-0x0020101f (0x000020)/ (ITOC_Header) - OK
     /0x00203000-0x0020323f (0x000240)/ (FW_MAIN_CFG) - OK
     /0x00204000-0x0020437f (0x000380)/ (FW_BOOT_CFG) - OK
     /0x00205000-0x002057ff (0x000800)/ (HW_MAIN_CFG) - OK
     /0x00206000-0x002060ff (0x000100)/ (HW_BOOT_CFG) - OK
     /0x00207000-0x002195e3 (0x0125e4)/ (PCI_CODE) - OK
     /0x0021a000-0x0021e3a7 (0x0043a8)/ (IRON_PREP_CODE) - OK
```

```
     /0x0021f000-0x00226bab (0x007bac)/ (PCIE_LINK_CODE) - OK
     /0x00227000-0x002a888f (0x081890)/ (MAIN_CODE) - OK
     /0x002a9000-0x002a95bf (0x0005c0)/ (POST_IRON_BOOT_CODE) - OK
     /0x002aa000-0x002aa3ff (0x000400)/ (IMAGE_INFO) - OK
     /0x002aa400-0x002b3e7b (0x009a7c)/ (FW_ADB) - OK
     /0x002b3e7c-0x002b4277 (0x0003fc)/ (DBG_LOG_MAP) - OK
     /0x002b4278-0x002b427f (0x000008)/ (DBG_FW_PARAMS) - OK
     /0x003fa000-0x003fbfff (0x002000)/ (NV_DATA) - OK
     /0x003fd000-0x003fd1ff (0x000200)/ (DEV_INFO) - OK
     /0x003ff000-0x003ff13f (0x000140)/ (MFG_INFO) - OK
     /0x003ff140-0x003ff13f (0x000000)/ (VPD_R0) - OK
FW image verification succeeded. Image is bootable.
```

Appendix G: Update Package for Mellanox Firmware

G.1 Overview

Update Package for Mellanox Firmware (UPMF) is a new method used to distribute firmware to end users. Instead of providing multiple binary files (one for each board type) and burning them using the flint tool, the UPMF method requires only a single standalone file.

The UPMF is a self-extracting executable that contains a set of Mellanox firmware binary images, and the mlxfwmanager firmware update tool.

When executed, the UPMF:

- Extracts its content into a temporary location
- Scans the locally installed Mellanox devices firmware versions
- Performs firmware updates if needed
- Cleans up temporary files

The UPMF method and its related tools are released as Beta in MFT 3.1.0. The current firmware update method, updating firmware using flint and .bin file is still supported.

G.1.1 Update Package for Mellanox Firmware Features

- Single file per firmware release
- Simple 'one click' firmware update
- Compact size (achieved by efficient compression of the firmware images)
- No installation required

G.2 Update Package for Mellanox Firmware Generation Flow

The `mlx_fwsfx_gen` tool is used for OEMs that wish to create their own UPMFs that contain their own customized firmware images.

To install the `mlx_fwsfx_gen` tool, the installation script should be run with the `"--oem"` command line option.

G.2.1 mlx_fwsfx_gen Usage

This tool packs the firmware images provided in the input directory and the mlxfwmanager update tool into a single standalone self-extracting executable.

The UPMF generation is supported on Linux and Windows. Being an executable file, the UPMF should be prepared for Linux and Windows separately.

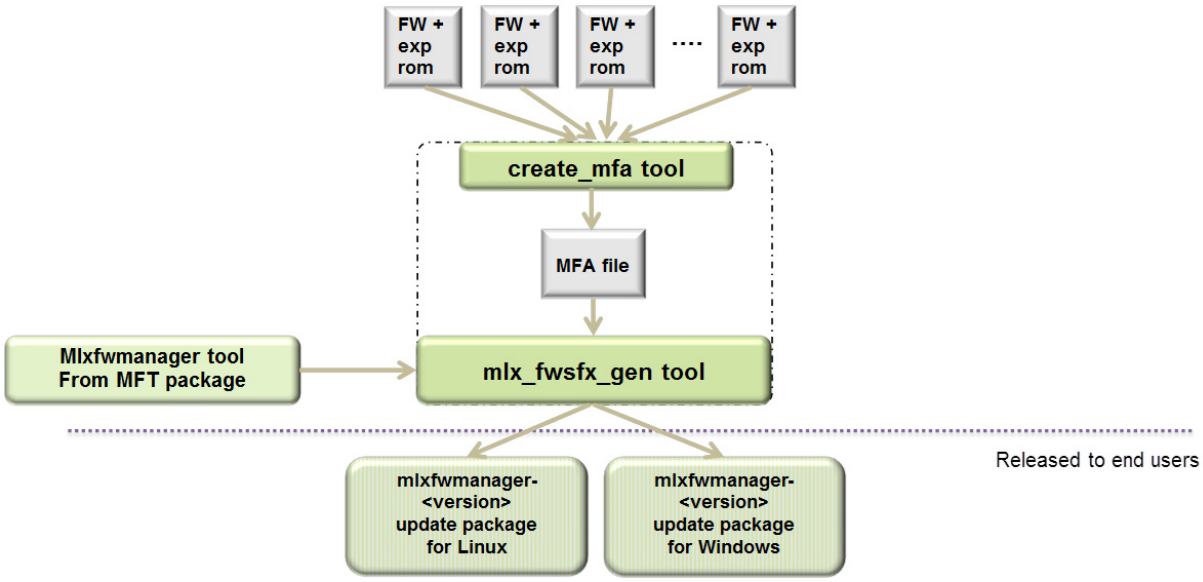
Usage:

```
# mlx_fwsfx_gen --source-dir <FW images directory>  --out-dir <output directory>  [--
sfx-name <sfx file name>] [--phy-support --phy-img <phy-img>]
```

Where:

--source-dir	Directory containing Mellanox firmware images to be included in the package. This option may be used more than once to specify more than one source directory.
--out-dir	Specifies the output directory.
--certificate	SSL certificate.
--phy-support	Generate extractor with mlxphyburn support.
--phy-img	PHY firmware image.
sfx-name	The self-extracting executable filename. The default name is `mlxfwmanager-YYYYMMDD-<build number>`, where build number is the previous maximum build number existing in the output directory incremented by one.

Figure 4: UPMF Package Generation Flow



G.2.2 UPMF Generation Example

The below example packs 3 firmware binaries (named fw-ConnectX-3-1.bin, fw-ConnectX-3-2.bin, fw-ConnectX-3-3.bin) located in the directory '/tmp/fw-ConnectX-3-dir/'into a Linux UPMF package named /tmp/mlxfwmanager-20141126-1.

```
mlx_fwsfx_gen --source-dir /tmp/fw-ConnectX-3-dir --out-dir /tmp

Package name: /tmp/mlxfwmanager-20141126-1
Contents:
Source dirs: /tmp/fw-ConnectX-3-dir
Adding file: /etc/mft/ca-bundle.crt
sfx_stub file: /usr/bin/mlx_sfx_stub
Creating intermediate MFA archive from binary files:
fw-ConnectX-3-1.bin
fw-ConnectX-3-2.bin
fw-ConnectX-3-3.bin
mfa tool: /usr/bin/mlx_mfa_gen
mfa cmd: /usr/bin/mlx_mfa_gen -p /tmp/Pcgs82KTxr/srcs.mfa  -s /tmp/fw-ConnectX-3-dir
Adding bins from /tmp/fw-ConnectX-3-dir

Files copied: 3

Querying images ...
Files queried: 3
Compressing ... (this may take a minute)

Archive: /tmp/Pcgs82KTxr/srcs.mfa
Total time: 0m2s
Adding file: /tmp/Pcgs82KTxr/srcs.mfa
Adding file: /usr/bin/mlxfwmanager_pci
Creating zip /tmp/Pcgs82KTxr/zippackage.zip
  adding: srcs.mfa (deflated 0%)
  adding: mlxfwmanager_pci (deflated 57%)
  adding: ca-bundle.crt (deflated 45%)

sfx auto-run command:
 mlxfwmanager_pci -u --log-on-update --ssl-certificate %ca-bundle.crt% %current-dir%
%argv%

Log name: /tmp/mlxfwmanager-20141126-1.log
```

G.2.3 UPMF Generation with PHY Binary Example

The below example packs 3 firmware binaries (named fw-ConnectX-3-1.bin, fw-ConnectX-3-2.bin, fw-ConnectX-3-3.bin) located in the directory '/tmp/fw-ConnectX-3-dir/' and a PHY image '/tmp/Firmware_1.37.10_N32722.cld' into a Linux UPMF package named /tmp/mlxfwmanager-20141126-2

```
mlx_fwsfx_gen --source-dir /tmp/fw-ConnectX-3-dir --out-dir /tmp --phy-support --phy-
img /tmp/Firmware_1.37.10_N32722.cld

Creating /tmp/C04TldeQHr/phy_mfa direcotry
Package name: /tmp/mlxfwmanager-20141126-2
Contents:
Source dirs: /tmp/fw-ConnectX-3-dir
Adding file: /etc/mft/ca-bundle.crt
sfx_stub file: /usr/bin/mlx_sfx_stub
Creating intermediate MFA archive from binary files:
fw-ConnectX-3-1.bin
fw-ConnectX-3-2.bin
fw-ConnectX-3-3.bin
mfa tool: /usr/bin/mlx_mfa_gen
mfa cmd: /usr/bin/mlx_mfa_gen -p /tmp/YaH5BAoQ8q/srcs.mfa  -s /tmp/fw-ConnectX-3-dir
Adding bins from /tmp/fw-ConnectX-3-dir

Files copied: 3

Querying images ...
Files queried: 3
Compressing ... (this may take a minute)

Archive: /tmp/YaH5BAoQ8q/srcs.mfa
Total time: 0m1s
Adding file: /tmp/YaH5BAoQ8q/srcs.mfa
Adding file: /usr/bin/mlxfwmanager
Copying /tmp/Firmware_1.37.10_N32722.cld to /tmp/C04TldeQHr/phy_mfa
Adding file: /tmp/Firmware_1.37.10_N32722.cld
Adding file: /usr/bin/mlxphyburn
Creating zip /tmp/YaH5BAoQ8q/zippackage.zip
  adding: srcs.mfa (deflated 0%)
  adding: ca-bundle.crt (deflated 45%)
  adding: phy_mfa/ (stored 0%)
  adding: phy_mfa/Firmware_1.37.10_N32722.cld (deflated 44%)
  adding: mlxfwmanager (deflated 57%)
  adding: mlxphyburn (deflated 60%)

sfx auto-run command:
 mlxfwmanager -u --log-on-update --ssl-certificate %ca-bundle.crt% %current-dir% %argv%

mlxphyburn auto-run command:
 mlxphyburn %device% -i ./phy_mfa/Firmware_1.37.10_N32722.cld b

Log name: /tmp/mlxfwmanager-20141126-2.log
```

G.3 Updating Firmware Using an UPMF

Updating the firmware is done by simply executing the UPMF.

Most of the command line options of the mlxfwmanager tool apply also for the UPMF.

For further detail, please refer to Section 2.2, “mlxfwmanager - Firmware Update and Query Tool”, on page 24.

Some of the most commonly used command line options are:

--force	Force firmware update even if the firmware in the UPMF in not newer than the one on the device.
--yes	Non-interactive mode - assume 'yes' to all questions.
--list	List the supported part numbers for which a firmware is available in the package..

In addition to the mlxfwmanager tool command line options, the UPMF has 2 additional options:

Additional UPMF self extractor options:

--sfx-extract-dir <dir>	Use <dir> for temporary files during execution
--sfx-extract-only	Do not execute, only extract files to a location specified through the --sfx-extract-dir option
--sfx-no-pause	Do not wait for user keypress after completion. **Note:** This flag is used in Windows OSs.

Extraction Example:

```
# mlxfwmanager-20130717-1 --sfx-extract-dir ./mydir --sfx-extract-only
  Extracting to mydir/mlxfwmanager-20130717-1 ... Done
```

Run the firmware update command:

```
# ./mydir/mlxfwmanager-20130717-1/mlxfwmanager -u
```

Appendix H: Secure Host Feature

Secure host is the general term for the capability of a device to protect itself and the subnet from malicious software through mechanisms such as blocking access of untrusted entities to the device configuration registers, directly (through pci_cr or pci_conf) and indirectly (through MADs).

WARNING:

- Once a hardware access key is set, the hardware can be accessed only after the correct key is provided.
- If a key is lost, please refer to Appendix H.1.5,"Recover Lost Key," on page 97

The hardware access in this mode is allowed only if a correct 64 bits key is provided.

The secure host feature requires a MLNX_OFED driver installed on the machine.

H.1 Using the Secure Host

H.1.1 Generating/Burning a Firmware supporting Secure Host Feature

1. Make sure you have INI and mlx files suitable for the device.

   Both files are available for download at:

   http://www.mellanox.com/page/custom_firmware_table

   a. Add cr_protection_en=true under [HCA] section in the INI file.

   b. Generate an image using mlxburn, for example run:

```
# mlxburn -fw ./fw-4099-rel.mlx -conf ./secure_host.ini -wrimage fw-4099.secure.bin
```

2. Burn the image on the device using flint:

```
# flint -d /dev/mst/mt4099_pci_cr0 -i fw-4099.secure.bin b
```

3. For changes to take effect, reboot is required.

H.1.2 Setting the Secure Host Key

➢ ***To set the key, run:***

```
# flint  -d /dev/mst/mt4099_pci_cr0 set_key 22062011
Setting the HW Key   - OK
```

```
Restoring signature  - OK
```

A driver restart is required to activate the new key.

H.1.3 Disabling/Enabling Access to the Hardware

1. Access the hardware while hardware access is disabled:

```
# flint  -d /dev/mst/mt4099_pci_cr0 q
E- Cannot open /dev/mst/mt4099_pci_cr0: HW access is disabled on the device.
E- Run "flint -d /dev/mst/mt4099_pci_cr0 hw_access enable" in order to enable HW
access.
```

2. Enable hardware access:

```
# flint  -d /dev/mst/mt4099_pci_cr0 hw_access enable
Enter Key: ********
```

3. Disable hardware access:

```
# flint  -d /dev/mst/mt4099_pci_cr0 hw_access disable
```

H.1.4 Removing secure host feature

➢ ***To remove the secure host feature:***

Step 1. Make sure you have INI and MLX file suitable for the device.

a. Remove cr_protection_en=true from the INI (if present)

b. Generate the image using mlxburn, for example run:

```
 # mlxburn -fw ./fw-4099-rel.mlx -conf ./unsecure_host.ini -wrimage fw-4099.unse-
cure.bin
```

Step 2. Burn the firmware on the device (make sure hardware access is enabled prior to burning)

```
 # flint -d /dev/mst/mt4099_pci_cr0 -i fw-4099.unsecure.bin b
```

Step 3. Execute a driver restart in order to load the unsecure firmware..

```
 # service openibd restart
```

H.1.5 Recover Lost Key

If a key is lost, there is no way to recover it using the tool. The only way to recover it is to:

Step 1. Connect the flash-not-present jumper on the card.

Step 2. Reboot the machine.

Step 3. Re-burn firmware

Step 4. Remove the flash-not-present jumper.

Step 5. Reboot the machine

Step 6. Re-set the hardware access key

Appendix I: Booting HCA Device in Livefish Mode

In case a MLNX HCA fails to boot properly and is not being identified by the system due to a corrupt firmware, the user is able to boot the card in livefish mode in order to re-burn the card.[1]

To do so, a direct access to the card is needed. By connecting the two flash present pins using a jumper while the machine is powered off, the card will boot in Flash not present mode (the firmware will not be loaded from the flash) i.e livefish.

I.1 Booting Card in Livefish Mode

➢ ***To boot the card in livefish mode:***

Step 1. Power off the machine.

Step 2. Locate the Flash Preset pins on the HCA.

Step 3. Close the two pins using a jumper.

Step 4. Power on the machine.

I.2 Booting Card in Normal Mode

➢ ***To boot the card in normal mode:***

Step 1. Power off the machine.

Step 2. Take off the jumper connected to the Flash Present pins on the HCA.

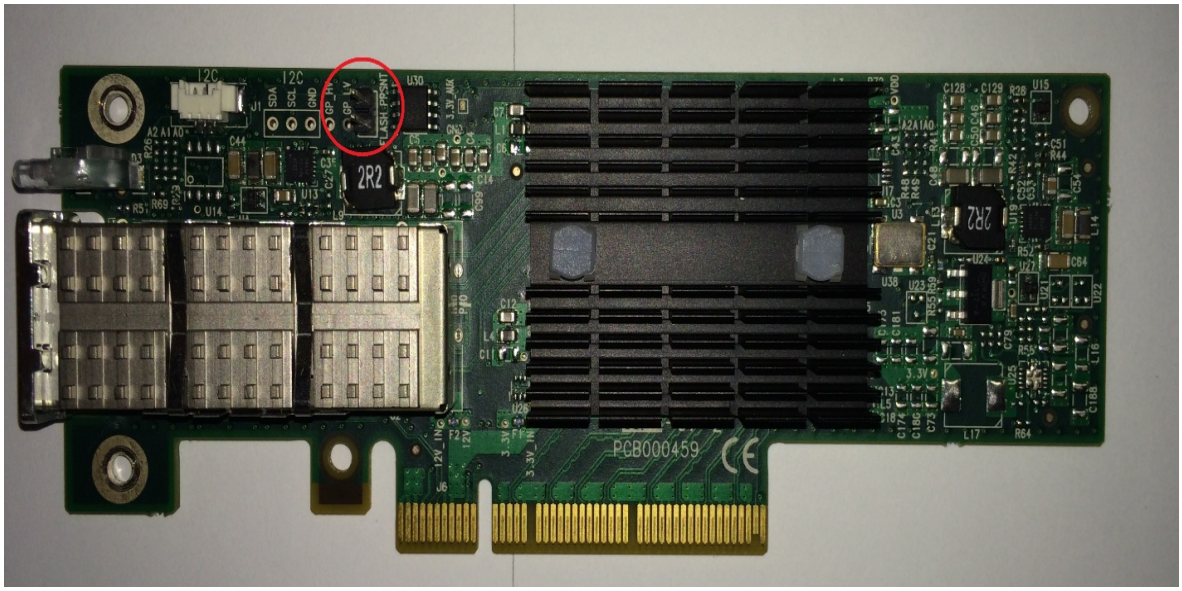
Step 3. Power on the machine.

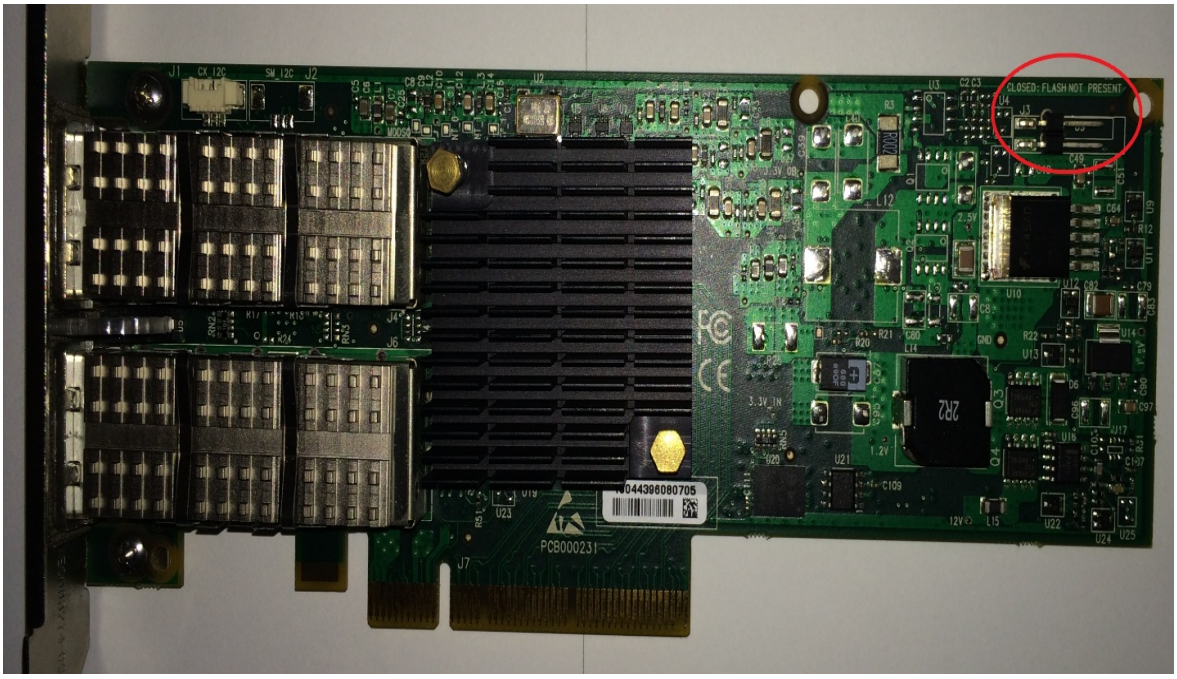
I.3 Common Locations of Flash Present Pins

The following photos show common locations of the Flash Present pins.

Existence and location of Flash Present pins depends on the board manufacture

1. Supported boards only


I2C
SDA
SCL
GND
FLASH_PRSNT
2R2
PCB000459


CLOSED: FLASH NOT PRESENT
2R2
0044396080705
PCB000231

Appendix J: Burning a New Connect-IB® Device

When burning a flash for the first time, the initial image should contain the correct GUIDs and VPD for the device. Subsequent firmware updates will not change these initial setting

flint for OEM is required for burning Connect-IB® for the first time.

J.1 GUIDs and MACs

The Connect-IB® image contains the Node, Port and System GUIDs and Port MACs to be used by the card. To simplify GUIDs assignment, the mlxburn tool can derive the MACs and GUIDs from a single base GUID according to Mellanox methodology:

Description:	UID	Number	Step
Port1 GUID:	base	8	1
Port2 GUID:	base + 8	8	1
Port1 MAC:	guid2mac[1](base)	8	1
Port2 MAC:	guid2mac(base + 8)	8	1

1. guid2mac(guid) is (((guid >> 16) & 0xffffff000000) | (guid & 0xffffff)). Meaning, remove the 2 middle bytes of an 8 bytes GUID to generate a 6 bytes MAC.

J.2 PCI Vital Product Data (VPD)

The VPD information is returned by the firmware upon VPD access from the PCI configuration header.

- The `vpd_ro` file last 3 bytes are the `vpd_rw` tag-id and length
- The size of the `vpd_r` file (including the above 3 bytes) should be a multiple of 4

J.3 Burning a New Connect-IB® Device

The VPD and GUIDs are stored in the last sector on flash that can be set as Write protected after the initial firmware burn.

J.3.1 To burn the Connect-IB® device:

Method 1: Generating Firmware With Specific GUIDs and Burning on the Flash

1. Generate the initial image with the correct GUIDs and VPD for the specific device, using the mlxburn tool. The generated image occupies full flash size.

```
# mlxburn -fw FW/fw-ConnectIB.mlx -c FW/MCB194A-FCA_A1.ini -wrimage fw-ConnectIB-
MCB194A-FCA_A1.bin -base_guid 0x0002c903002ef500 -vpd_r_file ./vpd_r_data.bin
```

2. Disable the Write protection.

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set Flash0.WriteProtected=Disabled
```

3. Burn the entire flash, using the flint tool.

```
# flint -d /dev/mst/mt511_pciconf0 -i ./fw-ConnectIB-MCB194A-FCA_A1.bin -
ocr -ignore_dev_data -allow_psid_change -nofs --yes burn
```

   In case the flash in use is Micron N25Qxx flash, shift the device info section by running the following command:

```
# flint -d /dev/mst/mt511_pciconf0 -ocr fi
```

4. Set Write protection on the last sector, using the flint:

   For devices using Winbond flash:.

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set Flash0.WriteProtected=Top,1-SubSectors
```

   For devices using Micron falsh:

```
flint -d /dev/mst/mt511_pciconf0 -ocr hw set Flash0.WritePro-tected=Top,1-Sectors
```

5. Enable flash quad SPI IO operations.

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set QuadEn=1
```

6. Set dummy cycles (relevant only for Micron N25Qxx flash):

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set DummyCycles=4
```

Method 2: Generating Firmware Image With Blank GUIDs, Burning and Setting GUIDs on the Flash

1. Generate the initial image with VPD for the specific device, using the mlxburn tool. The generated image occupies full flash size.

```
# mlxburn -fw FW/fw-ConnectIB.mlx -c FW/MCB194A-FCA_A1.ini -wrimage fw-ConnectIB-
MCB194A-FCA_A1.bin -vpd_r_file ./vpd_r_data.bin
```

2. Disable the Write protection.

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set Flash0.WriteProtected=Disabled
```

3. Burn the entire flash, using the flint tool.

```
# flint -d /dev/mst/mt5111_pciconf0 -i ./fw-ConnectIB-MCB194A-FCA_A1.bin -ocr -
ignore_dev_data -allow_psid_change -nofs --yes burn
```

   In case the flash in use is Micron N25Qxx flash, shift the device info section by running the following command:

```
# flint -d /dev/mst/mt511_pciconf0 -ocr fi
```

4. Set device manufacture GUIDs, run:

```
# flint -d /dev/mst/mt511_pciconf0 -ocr -uid 0x0002c903002ef500  smg
```

5. Set device GUIDs, run:

```
# flint -d /dev/mst/mt511_pciconf0 -ocr -uid 0x0002c903002ef500  sg
```

6. Set Write Protection on the last sector, using the flint tool.

   For devices using Winbond flash:.

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set Flash0.WriteProtected=Top,1-SubSectors
```

   For devices using Micron falsh:

```
flint -d /dev/mst/mt511_pciconf0 -ocr hw set Flash0.WritePro-tected=Top,1-Sectors
```

7. Enable flash quad SPI IO operations.

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set QuadEn=1
```

8. Set dummy cycles (relevant only for Micron N25Qxx flash):

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw set DummyCycles=4
```

- ***To view flash settings, run:***

```
# flint -d /dev/mst/mt511_pciconf0 -ocr hw query
```

- ***To view assigned GUIDs, run:***

```
# flint -d /dev/mst/mt511_pciconf0 -ocr q
```

- ***To change a GUID after the initial burn, run:***

```
# flint -d /dev/mst/mt4113_pciconf0 -ocr -uid 0x0002c903002ef500 sg
```

Appendix K: Burning a New Switch-IB™ Device

Upon first time flash burning, the GUIDs and VPD of the device are required to be set on the flash.

The sections below demonstrate two methods of burning a new Switch-IB™ device in order to set these initial settings. Subsequent firmware updates will not change these settings.

flint for OEM is required for burning Switch-IB™ for the first time.

For information regarding GUIDs, MACs and VPD, please refer to Appendix F: “Accessing Remote InfiniBand Device by Direct Route MADs,” on page 89.

K.1 To Burn the Switch-IB™ Device:

The examples below are for managed switches. For unmanaged switches, connect an MTUSB adapter (Appendix D: “MTUSB-1 USB to I2C Adapter,” on page 85) to the device and use the appropriate mst device (/dev/mst/mtusb…).

Method 1: Generating Firmware with Specific GUIDs and Burning it on the Flash

In order to burn a new Switch-IB™ device, follow the steps below:

1. Generate the initial image with the correct GUIDs and VPD for the specific device using the mlxburn tool. The generated image occupies full flash size.

```
# mlxburn -fw FW/fw-SwitchIB.mlx -c FW/MSB7700-E_Ax.ini -wrimage fw-SwitchIB-MSB7700-
E_Ax.bin -base_guid 0x0002c903002ef500 -vpd_r_file ./vpd_r_data.bin
```

2. Disable the Write protection.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash0.WriteProtected=Disabled
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash1.WriteProtected=Disabled
```

3. Burn the entire flash using the flint tool.

```
# flint -d /dev/mst/mt583_pciconf0 -i ./ fw-SwitchIB-MSB7700-E_Ax.bin -
ocr -ignore_dev_data -allow_psid_change -nofs --yes burn
```

4. Set Write protection

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash0.WriteProtected=Top,2-SubSectors
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash1.WriteProtected=Top,1-SubSectors
```

5. Enable flash quad SPI IO operations.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set QuadEn=1
```

Method 2: Generating Firmware Image with Blank GUIDs, Burning and Setting GUIDs on the Flash

In order to burn a new Switch-IB™ device, follow the steps below:

1. Generate the initial image VPD for the specific device using the mlxburn tool. The generated image occupies full flash size.

```
# mlxburn -fw FW/fw-SwitchIB.mlx -c FW/MSB7700-E_Ax.ini -wrimage fw-SwitchIB-MSB7700-
E_Ax.bin -vpd_r_file ./vpd_r_data.bin
```

2. Disable the Write protection.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash0.WritePro-tected=Disabled
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash1.WritePro-tected=Disabled
```

3. Burn the entire flash using the flint tool.

```
# flint -d /dev/mst/mt583_pciconf0 -i ./ fw-SwitchIB-MSB7700-E_Ax.bin -
ocr -ignore_dev_data -allow_psid_change -nofs --yes burn
```

4. Set device manufacture GUIDs.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr -uid 0x0002c903002ef500 smg
```

5. Set device GUIDs.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr -uid 0x0002c903002ef500 sg
```

6. Set Write protection.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash0.WriteProtected=Top,2-SubSectors
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set Flash1.WriteProtected=Top,1-SubSectors
```

7. Enable flash quad SPI IO operations.

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw set QuadEn=1
```

- ***To view flash settings:***

```
# flint -d /dev/mst/mt583_pciconf0 -ocr hw query
```

- ***To view assigned GUIDs:***

```
# flint -d /dev/mst/mt583_pciconf0 -ocr q
```

- ***To change a GUID after the initial burn:***

```
# flint -d /dev/mst/m52000_pciconf0 -ocr -uid 0x0002c903002ef500
sg
```